6.2.2.10.5 When the Tape Reader stops, press KEY RELEASE and verify:

R1 = 00401

Change 4: Revise Paragraph 6.2.19.11 to read as follows:

6.2.19.11 On PSAAM, set INHIBIT VOLTAGE FAIL switch ON. On K-148, enter the following:

VERB 01 NOUN 10	ENTR
00077	ENTR

Verify DSKY Row 1 display has bit 6 on. Other combinations of bits are permissible, but bit 6 must be on.

Change 5: Add Paragraph 6.2.19.11.1 as follows:

6.2.19.11.1 On K-148, enter the following sequence:

VERB 21 NOUN 10	ENTR
00077	ENTR
00000	ENTR
Press	RSET
VERB 21 NOUN 27	ENTR
77777	ENTR

Change 6: Revise Paragraph 6.2.19.18 to read as follows:

6.2.19.18 On PSAAM, set INHIBIT VOLTAGE FAIL switch ON. On K-148, enter the following:

VERB 01 NOUN 10	ENTR
00077	ENTR

Verify DSKY Row 1 display has bit 6 on. Other combinations of bits are permissible, but bit 6 must be on.

Change 7: Add Paragraph 6.2.19.18.1 as follows:

6.2.19.18.1 On K-148, enter the following sequence:

VERB 21 NOUN 10	ENTR
00077	ENTR
00000	ENTR
Press	RSET
VERB 21 NOUN 27	ENTR
77777	ENTR

Change 8: Revise Paragraph 6.2.19.25 to read as follows:

6.2.19.25 On PSAAM, set INHIBIT VOLTAGE FAIL switch ON. On K-148, enter the following:

VERB 01 NOUN 10	ENTR
00077	ENTR

Verify DSKY Row 1 display has bit 6 on. Other combinations of bits are permissible, but bit 6 must be on.

Change 9: Add Paragraph 6.2.19.25.1 as follows:

6.2.19.25.1 On K-148, enter the following sequence:

VERB 21 NOUN 10	ENTR
00077	ENTR
00000	ENTR
Press	RSET
VERB 21 NOUN 27	ENTR
77777	ENTR

Change 10: Revise Paragraph 6.2.19.33 to read as follows:

6.2.19.33 On K-148, enter the following:

VERB 01 NOUN 10	ENTR
00077	ENTR

Verify DSKY Row 1 display has bit 6 on. Other combinations of bits are permissible, but bit 6 must be on.

Change 11: Add Paragraph 6.2.19.33.1 as follows:

6.2.19.33.1 Terminate CMC Self Check by inserting into K-148:

VERB 21 NOUN 10	ENTR
00077	ENTR
00000	ENTR
Press	RSET
VERB 21 NOUN 27	ENTR
00000	ENTR

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POST INSTALLATION CHECKOUT
SPECIFICATION FOR LM G&N SYSTEM (KSC)

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approval
Ⓐ 3/31/67	A	33482	2, 3, 5-75; was 75 pages, now 83 pages.	MGM EA
6/30/67	B	34079	1, 2, 6-18, 20-88; Was 83 pages now 86 pages.	EA

This specification consists of page 1 to 86 inclusive.

APPROVALS	NOT REQUIRED CCA497-0274 NASA/MSC	12/[illegible]/66			AC

1. INTRODUCTION

1.1 The individual Spacecraft (SC) installed Guidance and Navigation (G&N) System to be checked out per the process specification shall consist of one of each of the following major assemblies. Refer to drawing 6015000 for specific system dash numbers and effectivities.

Assembly Name	Part Number
1 - Apollo Guidance Computer Group	6003001-XXX
1 - Inertial Meas. Unit & Pulse Torque Assembly	6007001-XXX
1 - Coupling Data Unit	2007222-XXX
1 - Power and Servo Assembly	6007200-XXX
1 - Computer Control & Reticle Dimmer Assembly	6014512-XXX
1 - G&N Interconnect Harness Assembly (LEM)	6014515-XXX
1 - Signal Conditioner Assembly	6070010-XXX
1 - Navigation Base Assembly (LEM)	6899950-XXX
1 - Alignment Optical Telescope (LEM)	6011000-XXX

1.2 The G&N System herein shall be identified by Part #6015000. The computer contains the **BURST 116 program flight ropes in the core rope memory.**

2. SCOPE

2.1 This specification outlines the checkout requirements for G&N System installed in a LEM **Vehicle. Addendum to this specification will cover any** special checkout requirements associated with individual vehicles, G&N Systems **and Computer Flight Programs.**

3. APPLICABLE DOCUMENTS

3.1

Document Number	Subject
LIS-540-10001	LEM-PGNS Functional Interface
LID-340-10000	ICD-PGNS (LGC-CDU-PSA and Sig. Cond.) Instl.
LID-340-10010	ICD-LEM DSKY Installation
LID-280-10004	ICD-IMU-AOT-NVB-PTA Installation
LID-390-10001	ICD-LEM Wiring Electrical Interface for PGNS
LID-540-10001	ICD-LEM-PGNS Functional Interface Flow Diagram

5.2.2 The PSA, CDU, and PTA cold plates shall be provided with coolant as per ICD LIS-510-10001.

5.3 Test Equipment Tolerances

5.3.1 Measurements and tolerances specifications stated herein are basic G&N System performance specifications. Calibration data must be supplied to the Acceptance Checkout Equipment (ACE) for the Power and Servo Assembly Adapter Module (PSAAM) and Signal Conditioner Assembly (SCA) performance. Final tolerances must include PSAAM and Signal Conditioner stability uncertainties (See Appendix 1) as well as ACE and ACE carry-on conditioning uncertainties. All uncertainties due to instrumentation shall be root sum squared with the basic G&N subsystem tolerance to yield an acceptable tolerance for use when testing the G&N system in the spacecraft.

5.3.2 In the event of a conflict between requirements, the following order of precedence shall apply. The contractor shall also notify AC Electronics Site Manager of the conflict.

a. The contract
b. The Specification
c. Documents referenced in this specification.

5.4 Test Sequence

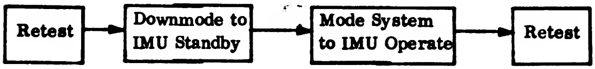
5.4.1 The test sequence shall normally follow the flow gram in Figure 1. Any test subsequent to Temperature Control Verification Section 6.3.4 may be conducted providing the General Turn On Procedure 6.2.4 is followed.

5.5 The generation of noise alarm indication, as evidenced by one or more Noise Peak Event Lamps becoming lighted shall be cause for immediate determination of effects on the G&N system test in progress. In the event of detrimental effects on the system test a troubleshooting routine shall be entered to determine the cause of the alarm. Testing shall continue only after demonstrating that the cause of the noise alarm has been located and that remedial action has been or will be taken, or that the transient or noise causing the alarm has no detrimental effect on the G&N System or test in progress.

5.6 Test Failure Criteria

5.6.1 IRIG and PIPA data (See paragraph 6.3.9)

5.6.1.1 If D_1, D_2, or D_3 exceeds its maximum value as specified in 6.3.9 for any IRIG or PIPA, a retest sequence shall be initiated as indicated below:



RETEST SEQUENCE

The retest sequence shall be performed only for the test positions indicated in the table below, corresponding to the original out-of-spec parameter. In addition, other selected parameters shall be recalculated and qualified.

O.O.S. PARAMETER	PERFORM POSITIONS	PARAMETERS TO BE REQUALIFIED
NBDY	1	NBDY
NBDZ	1 thru 2	NBDZ, NBDY, X PIPA SF error, X PIPA bias
NBDX	1 thru 3	NBDX, NBDZ, NBDY, X PIPA SF error, X PIPA bias, ADIAX
ADSRAY	1 thru 4	ADSRAY, NBDX, NBDZ, NBDY, X PIPA SF error, X PIPA bias, ADIAX, ADIAZ, Z PIPA SF error, Z PIPA bias
ADSRAZ	1 thru 9	ADSRAZ, ADSRAY, NBDX, NBDZ, NBDY, X PIPA SF error, X PIPA bias, ADIAX, ADIAZ, Z PIPA SF error, Z PIPA bias, ADSRAX, Y PIPA SF error, Y PIPA bias
ADSRAX	1 thru 7	ADSRAX, ADSRAY, NBDX, NBDZ, NBDY, X PIPA SF error, X PIPA bias, ADIAX, ADIAZ, Z PIPA SF error, Z PIPA bias, Y PIPA SF error, Y PIPA bias
ADIAY	1 thru 10	All
ADIAZ	1 thru 4	ADIAZ, NBDX, NBDZ, NBDY, X PIPA SF error, X PIPA bias, ADIAX, Z PIPA SF error, Z PIPA bias, ADSRAY
ADIAX	1 thru 3	ADIAX, NBDX, NBDZ, NBDY, X PIPA SF error, X PIPA bias
X PIPA bias of SF error	1 thru 2	X PIPA SF error, X PIPA bias, NBDZ, NBDY
Z PIPA bias or SF error	1 thru 4	Z PIPA SF error, Z PIPA bias, ADSRAY, NBDX, NBDZ, NBDY, X PIPA SF error, X PIPA bias, ADIAX, ADIAZ
Y PIPA bias or SF error	1 thru 6	Y PIPA SF error, Y PIPA bias, Z PIPA SF error, Z PIPA bias ADSRAY, NBDX, NBDZ, NBDY, X PIPA SF error, X PIPA bias, ADIAX, ADIAZ

If D_1, D_2, and D_3 are within tolerance after the retest sequence is completed, the original out-of-tolerance terms calculated in 6.3.9.70.4 shall be exonerated.

If D_1, D_2, and D_3 are within tolerance after the retest sequence is completed, the original out-of-tolerance terms calculated in paragraph 6.3.9.70.4 shall be exonerated.

5.6.1.2 Failure to be within the maximum values of D_1, D_2, and D_3 after the retest sequence of 5.6.1.1 shall constitute a failure of the assembly.

5.6.2 Failure of the G&N System to pass any examination or test specified herein shall tentatively classify the G&N system as non-conforming. Normal test sequence may be continued upon determination of the cause of the nonconformance or at the discretion of the G&N contractor test team if it is determined that such action is not detrimental to the G&N System or other interfacing subsystems. All nonconformances shall be investigated and cleared by waivers (F.N.N), correction of specification, or hardware replacement and retest. The suspected malfunctioned hardware shall be removed and returned to the laboratory where the malfunction shall be verified. Only after malfunction verification shall a flight certified replaceable element be installed in the G&N System.

5.7 Retest subsequent to replacement of a malfunctioned assembly with that of a flight certified assembly shall be at the discretion of NASA Engineering. Table II can be used as a guide to determine general retest requirements. In all retest procedure, the test sequence of Figure 2 shall be adhered to. [illegible], Figure 2.

5.8 It is assumed that the Test Conductor has a working knowledge of the test equipment used; therefore, this procedure contains only the steps pertaining directly to the G&N components. If any questions arise concerning the test equipment, the Test Conductor should refer to the respective operational manuals.

5.9 Spacecraft systems other than the G&N System may be operating on a noninterfering basis while individual system checkout of the G&N is being conducted.

5.10 Data Retrival

5.10.1 All data concerning the checkout and operation of the G&N System as monitored via ACE, shall be recorded on the data sheets associated with their corresponding test. Out of tolerance readings shall be recorded and flagged by appropriate signals.

5.10.2 During G&N System testing, all interleaved data, Uplink Command File and Downlink Data File shall be maintained (recorders ON). All A/B PCM data, that is not made available to the ACE displays shall be verified by requesting a time history data strip out of said data for the time period when the test was performed.

Paragraph No.	Test Title
6.3.1	Standby Power In Test
6.3.2	Alarms and Interrupts Test
6.3.3	IMU Operate Power On Test
6.3.4	Temperature Control Verification
6.3.5	PGNCS Power Supply Test
6.3.6	IMU Operational Test
6.3.7	PGNCS Operational Test
6.3.8	IRIG Scale Factor Test
6.3.9	IMU Performance Test
6.3.10	LGC Voltage Margin Test
6.3.11	LGC Clock Frequency Test
6.3.12	Gimbal Friction Test
6.3.13	Stabilization Loop Response Test
6.3.14	G and N Fine Alignment Test
6.3.15	AOT Functional Performance Test
6.3.16	Flight Rope Fixed Memory Bank Sum Check
6.3.17	LGC Clock Alignment Test

G&N TESTS

FIGURE 1

6. DETAILED REQUIREMENTS

6.1 Initial Test Conditions

6.1.1 The IMU shall be supplied with heater power on a continuous basis. The portable temperature controller (Model No. 410-31058) shall be connected at all times although heater power may be supplied from the +28 VDC IMU STANDBY bus and monitored through ACE.

6.1.2 The IMU shall never be without heater power longer than 15 minutes.

6.2 Operational Requirements

TABLE I RETEST SEQUENCE

Paragraph Number	Test Title	LGC	IMU	PSA	CDU	PTA	DSKY	A HARNESS	B HARNESS	Computer Control & Reticle Dimmer	Nav Base	Alignment Optical Telescope	Signal Conditioner
6.3.1	Standby Power On Test	X	X	X			X	X	X		X		
6.3.2	Alarms and Interrupts Test	X					X	X					
6.3.3	IMU Operate Power On Test		X	X	X	X		X	X		X		X
6.3.4	Temperature Control Verification		X	X				X	X		X		X
6.3.5.	PGNCS Power Supply Test			X	X	X		X	X		X		X
6.3.6	IMU Operational Test	X	X	X	X	X		X	X		X		
6.3.7	PGNCS Operational Test		X	X	X			X	X		X		X
6.3.8	IRIG Scale Factor Test		X	X		X		X	X		X		
6.3.9	IMU Performance Test		X	X		X		X	X		X		
6.3.10	LGC Voltage Margin Test	X						X					
6.3.11	LGC Clock Frequency Test	X						X		X			
6.3.12	Gimbal Friction Test		X	X				X	X		X		X
6.3.13	Stabilization Loop Response Test		X	X		X		X	X		X		
6.3.14	G&N Fine Alignment Test		X	X	X			X	X		X	X	
6.3.15	AOT Functional Performance Test											X	
6.3.16	Flight Rope Fixed Memory Bank Sum Check	X						X					
6.3.17	LGC Clock Alignment Test	X						X					
6.2.1	Emergency Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.2	Normal Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.3	Initial Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.4	General Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*

* To be used as necessary to turn system on or off.

6.2.1 Emergency Shutdown Procedure

CAUTION

In the event of any malfunction which might damage the G&N System before the normal shutdown procedure in 6.2.2 can be performed, power shall be removed from the G&N System as soon as possible. If at all possible, without creating any delay, IMU Operate Power should be removed first.

6.2.2 Normal Shutdown Procedure

6.2.2.1 The normal shutdown of a G&N System shall include parking the gimbals prior to removing IMU Operate Power. This is accomplished in the following procedure.

6.2.2.2 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+09000 ENTR

6.2.2.3 On the CRT, verify the following platform angles are displayed:

IG is between 358 and 002
MG is between 088 and 092
OG is between 358 and 002
Verify Gimbal Lock Lamp is lighted.

6.2.2.4 Pull out +28 VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11 to remove IMU OPERATE power.

6.2.2.5 Pull out +28 VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11 to remove LGC OPERATE power.

6.2.2.6 Pull out +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11 to remove IMU STANDBY power.

6.2.3 Initial Turn-On Procedure

6.2.3.1 Proper coolant flow shall be verified prior to application of any power to the G&N System.

6.2.3.2 The initial power turn-on sequence shall be in the order specified in the test procedures (6.3) observing all cautions and delays as specified.

6.2.4 General Turn-On Procedure

6.2.4.1 This step shall be effective only after having completed the initial turn-on procedures.

6.2.4.2 Proper coolant flow shall be verified.

6.2.4.3 Depress +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11 to supply IMU STANDBY power. Record time.

6.2.4.4 Depress +28 VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11 to supply LGC Operate Power. The Restart lamp may come on; if it does press RSET on the DSKY.

6.2.4.6 On K-148 enter the following sequence:

Press ERROR RESET
VERB 36 ENTR (fresh start)
VERB 57 ENTR
00015 ENTR
VERB 21 NOUN 27 ENTR
77777 ENTR (LGC Self Check)

6.2.4.7 On the CRT, verify that the 3.2KC 28V Supply indicates between 28.04 and 29.16 VRMS (GG 1331).

6.2.4.8 On the CRT DSKY display verify that R1 does not display 01102 or 41102 (indicating a malfunction).

6.2.4.9 After 5 minutes enter the following in K-148:

a.	VERB 34	ENTR
b.	VERB 21 NOUN 27	ENTR
c.	00000	ENTR
d.	VERB 25 NOUN 01	ENTR
e.	03770	ENTR SET LOC
f.	10067	ENTR CCS NEW JOB
g.	05532	ENTR TC CHANG1
h.	01770	ENTR TC ACTLITON
i.	VERB 25 NOUN 26	ENTR CALL PRIO/DELAY
j.	01000	ENTR 01 PRIORITY
k.	01770	ENTR RELATIVE E-MEM
m.	00007	ENTR BANKADD.
n.	VERB 30	ENTR REQ EXEC.

NOTE: If a VERB 36 is performed after the above information has been entered repeat lines 6.2.4.9.i through 6.2.4.9.n.

6.2.4.10 **CAUTION:** LGC OPERATE and IMU STANDBY power must have been applied a minimum of two hours before energizing the IMU OPERATE circuit breaker in step 6.2.4.16 unless all of the following conditions are met:

IF:
1. The G&N System has previously been in Standby Mode at least two hours and subsequently been in Operate Mode, AND
2. The gimbals were placed in a parked position prior to shutdown, AND
3. The shutdown period did not exceed 5 days, AND
4. The Spacecraft or IMU have not been moved in any way during the shutdown period.

THEN: The two-hour Standby Mode operation requirement is reduced to 15 minutes.

6.2.4.11 The G&N System is defined as being in Standby Mode when LGC Operate and IMU Standby power is applied and IMU Operate power is off. The inertial components shall have suspension power in Standby Mode.

6.2.4.12 The G&N System is defined as being in Operate Mode when LGC OPERATE, IMU STANDBY and IMU OPERATE POWER is applied to the system.

6.2.4.13 Set up analog recorder to monitor the following signals:

Signal No.	Signal Name
a. GG 2136	MG Servo Error Total
b. GG 2106	IG Servo Error Total
c. GG 2166	OG Servo Error Total
d. GG 2112	IG 1X Resolver Sine
e. GG 2172	OG 1X Resolver Sine
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1Ø 800 CPS

6.2.4.14 Start the analog recorder at a chart speed of 5 mm/sec. Start the event recorder at a chart speed of 1.[illegible] mm/sec. ([illegible]).

6.2.4.15 On CRT, monitor +120 VDC PIPA SUPPLY (GG 1040) and IMU Gimbal angles. Record time. If 15 minutes have elapsed since performing paragraph 6.2.4.3 proceed to the next paragraph.

6.2.4.16 Press in +28VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11. Record time.

6.2.4.17 Verify on the analog recorder that the oscillations of the resolver sine signals (GG 2112, GG 2172, and GG 2142) are not sustained and that the signals damp out within 15 seconds. If this condition is not attained, remove IMU OPERATE power immediately.

6.2.4.18 On the CRT, verify absence of +120 VDC PIPA SUPPLY voltage for 90 ± 10 seconds after step 6.2.4.16 is initiated. Verify that this voltage is between 114 and 126 after 100 seconds from step 6.2.4.16.

6.2.4.19 Verify absence of LGC WARNING, ISS WARNING, and PGNCS CAUTION lights in the LEM cabin.

6.2.4.20 On the CRT, verify all IMU Gimbal angles between 358 and 002.

6.2.4.21 On K-148 enter the following sequence:

```
VERB 41      NOUN 20      ENTR
+00000  ENTR
+00000  ENTR
+00000  ENTR
```

6.2.4.22 On the CRT, scan the power supply voltages to verify their normal operation. (No indications flashing).

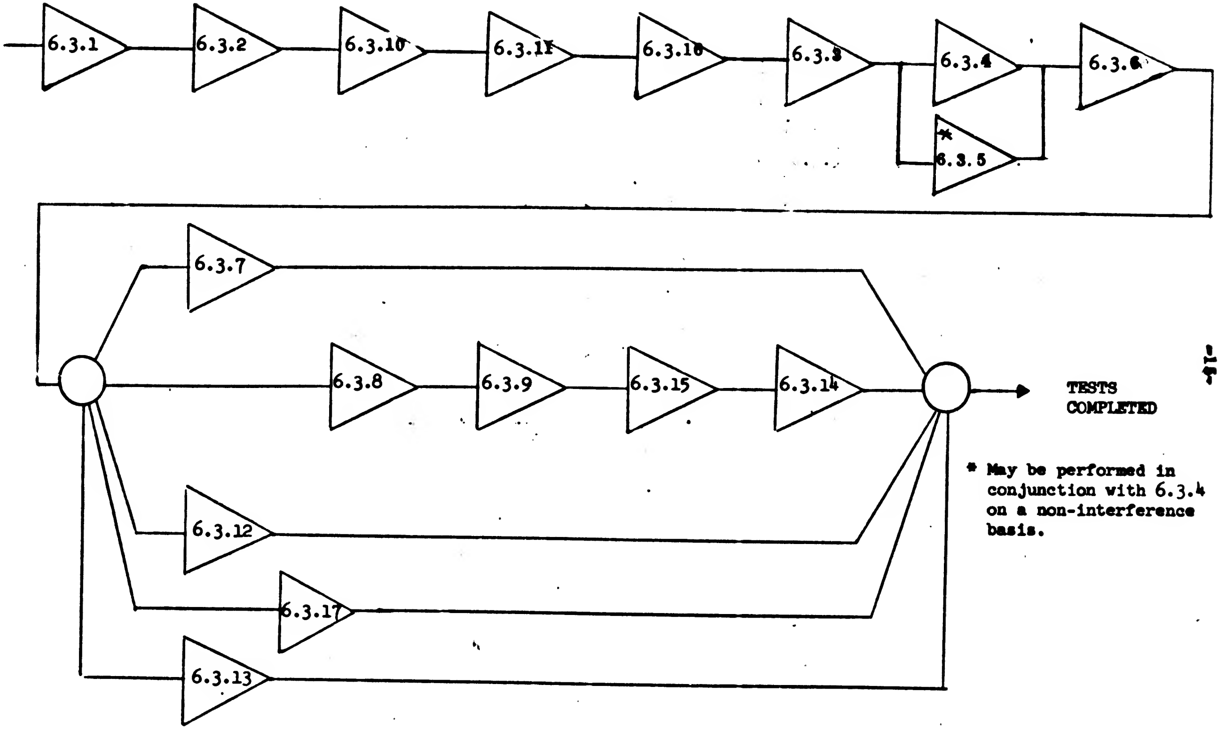
6.2.4.23 After all the tests of 6.3 in Figure 1 have been completed, the General Turn-On Procedure (6.2.4) and IMU Operational Test (6.3.6) shall be completed before re-running any test. Otherwise, the testing sequence shall continue in accordance with Figure 2.

6.2.5 Interruption of Power.

6.2.5.1 IMU Operate power shall never be applied without the presence of LGC Operate and IMU Standby Power.

6.2.5.2 The G&N System log book shall include the gimbal positions at time of power shutdown. If omitted, it shall be assumed that the gimbals were not parked prior to shutdown. The logbook shall also state if any movement of the IMU or Spacecraft has taken place after shutdown. The times of application and removal of any bus power to the G&N System shall be recorded.

6.2.5.3 After the system has been operating with IMU Operate power on, and a power interruption occurs, immediately set the IMU Operate power circuit breaker to OFF. When power is restored a minimum of 15 minutes operation in Standby Mode is required before resuming IMU Operate power. If the power interruption was longer than 15 minutes, the G&N System shall be run in Standby Mode for a time interval at least equal to the duration power was off before resuming IMU Operate power. However, this period need not exceed two hours before application of IMU Operate power.



* May be performed in conjunction with 6.3.4 on a non-interference basis.

TEST PROCEDURE FLOWGRAM

FIGURE 2

6.2.6 A warmup period of at least one hour in Operate Mode is required prior to performing any test in which gyro or accelerometer parameters are measured, and at least 15 minutes prior to any test in which precision amplitude and frequency power supply checks are made.

6.3 **Test Procedures**

6.3.1 **Standby Power On Tests**

6.3.1.1 The Portable Temperature Controller, Model No. 400-31058 shall be supplying inertial component heater power to the G&N System through connector 56J1 (P230). If alarm or fail indications are present on the PTC, they shall be cleared by depressing the SYSTEM RESET push-button on the PTC.

6.3.1.2 The following switches and/or circuit breakers shall be closed to energize the indicated buses.

LOCATION	NOMENCLATURE	IDENTIFICATION
Panel 14	BAT 5 NORMAL FEED	4S10
Panel 14	BAT 6 NORMAL FEED	4S11
Panel 16	X LUNAR BUS TIE	4CB5
Panel 16	BAT 1-4-6 FEED TIE	4CB17
Panel 16	BAT 2-3-5 FEED TIE	4CB25
Panel 16	ASC ECA	4CB14
Panel 16	ASC ECA CONT.	5CB7
Panel 16	DC BUS VOLT	4CB21
Panel 16	DISP.	4CB16
Panel 11	X LUNAR BUS TIE	4CB4
Panel 11	BAT 1-4-6 FEED TIE	4CB18
Panel 11	BAT 2-3-5 FEED TIE	4CB26
Panel 11	ASC ECA	4CB15
Panel 11	ASC ECA CONT.	4CB6
Panel 11	DC BUS VOLT	4CB22
Panel 16	INV. NO. 2	4CB13
Panel 14	AC PWR to INV 2 Position	4S14
Panel 11	AC BUS FEED TIE	4CB24
Pannel 11	AC BUS VOLT	4CB27

6.3.1.3 IMU Standby Power Turn On

6.3.1.3.1 Turn on Event Recorder to a speed of 10 mm/sec. ([illegible]).

6.3.1.3.2 Press in +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11. Record time.

6.3.1.3.3 Verify on the Event Recorder that +28 VDC IMU STANDBY power discrete (GG 1513) is on. On CRT +28V IMU STANDBY Bus (GG 1510) shall indicate between 24.5 and 33.5

6.3.1.3.4 The PIPA TEMP, displayed on CRT, shall be monitored periodically one hour to ensure that the PIPA Temperature Control circuitry is operating to maintain a temperature of 130±5.0 Deg. F. (GG 2300). One hour after performing step 6.3.1.3.2 record PIPA TEMP. The PIPA Temperature shall be 130.5° ±1.5°F. The IRIG temperature shall be within 3.0°F of the PIPA Temperature.

6.3.1.4 Computer Power Turn On

6.3.1.4.1 Press in +28VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11.

6.3.1.4.2 On CRT, +28V LGC Operate Bus (GG 1520) shall indicate between 24.5 and 33.5. Ignore computer alarm indications. Verify on event recorder that +28V LGC OP (GG 1523X) discrete is on. Using DSKY, enter VERB 36 ENTR then press RSET. All computer alarms shall clear.

6.3.1.4.3 On CRT, the +14VDC LGC SUPPLY (GG 1020) shall indicate between 13.6 and 14.4 VDC. Record this value.

6.3.1.4.4 On CRT the 28V 3200 CPS SUPPLY (GG 1331) shall indicate between a 28.04 and 29.16 VRMS. Record this value.

6.3.1.5 LGC Operational Tests

6.3.1.5.1 DSKY Check

6.3.1.5.1.1 Initiate the DSKY check by entering in the DSKY:
Press Error Reset
VERB 57 ENTR 00015 ENTR (clear erasable memory)
VERB 21 NOUN 27 ENTR
00011 ENTR

6.3.1.5.1.2 All the electroluminescent elements (PROG, VERB, NOUN and Row 1, Row 2, Row 3) shall display the decimal number nine (9). Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0/s
k. Minus signs in ROW 1, ROW 2, ROW 3
l. VERB-NOUN Flashing
m. COMP ACTY

} On concurrently for 5 seconds

o. Plus signs in ROW 1, ROW 2, ROW 3
p. VERB-NOUN Flashing
q. COMP ACTY

On concurrently for 5 seconds

r. COMP ACTY - On for 5 seconds then DSKY blanks

6.3.1.5.1.3 The DSKY pushbuttons shall be checked by entering:
VERB 25 NOUN 01 ENTR
01740 ENTR
+00123 ENTR
-00456 ENTR
-00789 DO NOT press ENTR

The DSKY shall display +00123 in Row 1, -00456, in Row 2, and -00789 in Row 3. Press CLR pushbutton three times on DSKY. Observe that Row 1, Row 2 and Row 3 are blank.

6.3.1.5.2 Lamp Test

6.3.1.5.2.1 Initiate the Lamp Test by entering in the DSKY:
VERB 35 ENTR

6.3.1.5.2.2 The following DSKY displays shall illuminate for approximately 5 seconds.

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in Row 1 Row 2 and 3.

On currently for approximately 5 seconds.

On CAUTION/WARNING panel, the following displays shall illuminate, then extinguish.
LGC
ISS
PGNS

6.3.1.5.3 Uplink Check

6.3.1.5.3.1 On K-START 148, set LOAD/INHIBIT switch to LOAD, set TAPE/KEY switch to KEY, then enter the following:

ERROR RESET
VERB 25 NOUN 01 ENTR
03375 ENTR
+01234 ENTR
-56789 ENTR
+00000 ENTR

6.3.2.1.2 On CRT, DSKY display, verify R1 = 33777 and R3 = 03377

6.3.2.1.3 On K-148 enter the following sequence

VERB 25 NOUN 26 ENTR
04000 ENTR
01777 ENTR
00006 ENTR
VERB 30 ENTR

6.3.2.1.4 Verify RESTART, and PGNCS CAUTION lamps are ON.

6.3.2.1.5 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.2.2 Rupt Lock-Interrupt Too Long

6.3.2.2.1 On K-148 enter the following sequence

VERB 24 NOUN 01 ENTR
03377 ENTR
30001 ENTR
03377 ENTR
VERB 25 NOUN 26 ENTR
00001 ENTR
01777 ENTR
00006 ENTR
VERB 31 ENTR

6.3.2.2.2 Verify RESTART, and PGNCS CAUTION lamps are ON.

6.3.2.2.3 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.2.3 TC Trap Test

6.3.2.3.1 On K-148 enter the following sequence

VERB 21 NOUN 01 ENTR
03377 ENTR
03377 ENTR
VERB 25 NOUN 26 ENTR
04000 ENTR
01777 ENTR
00006 ENTR
VERB 30 ENTR

6.3.2.3.2 Verify RESTART, and PGNCS CAUTION lamps are ON.

6.3.2.3.3 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.2.4 Nightwatchman Test

6.3.2.4.1 On K-148 enter the following sequence

VERB 24 NOUN 01 ENTR
03377 ENTR
30001 ENTR
03377 ENTR
VERB 25 NOUN 26 ENTR
03400 ENTR
01777 ENTR
00006 ENTR
VERB 30 ENTR

6.3.2.4.2 Verify RESTART, and PGNCS CAUTION lamps are ON.

6.3.2.4.3 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.3 IMU OPERATE POWER ON TESTS

CAUTION

Prior to application of IMU OPERATE power in step 6.3.3.1.4, LGC OPERATE and IMU STANDBY power must have been applied to the G&N System continuously for a minimum of two hours. The only exception is when the requirements of step 6.2.4.10 are met and this does not apply for the initial application of IMU OPERATE power.

NOTE: Perform the following DSKY entries before continuing:

a.	VERB 25	NOUN 01	ENTR	
b.	03770		ENTR	SET LOC
c.	10067		ENTR	CCS NEW JOB
d.	05532		ENTR	TC CHANG1
e.	01770		ENTR	TC ACTLITCN
f.	VERB 25	NOUN 26	ENTR	CALL PRIO/DELAY
g.	01000		ENTR	01 PRIORITY
h.	01770		ENTR	RELATIVE E MEMORY
i.	00007		ENTR	BANK ADD
j.	VERB 30		ENTR	REQ EXEC.

If a VERB 36 is performed after the above information has been entered repeat lines f through j.

6.3.3.1 **Verification of Power Turn-On**

6.3.3.1.1 Set up analog recorder to monitor the following signals:

SIGNAL NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2106	IG Servo Error Total
c. GG 2166	OG Servo Error Total
d. GG 2112	IG 1X Resolver Sine
e. GG 2172	OG 1X Resolver Sine
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1% 800 cps
h. SPARE	

6.3.3.1.2 Start analog recorder to a chart speed of 5 mm/sec. Start event recorder at a chart speed of 1.0 mm/sec.

6.3.3.1.3 On CRT, monitor +120 VDC PIPA SUPPLY (GG 1040) and IMU gimbal angles.

6.3.3.1.4 Press in +28 VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11. Record time.

6.3.3.1.5 Verify on analog recorder that the oscillations of the resolver sine signals (GG 2112, GG 2172, and GG 2142) are not sustained and that the signals damp out within 15 seconds. If they don't, remove IMU OPERATE power as soon as possible.

6.3.3.1.6 On the CRT, verify absence of +120 VDC PIPA SUPPLY voltage for 90±10 seconds after step 6.3.3.1.4 is initiated. Verify that this voltage is between 114 and 126 after 100 seconds from step 6.3.3.1.4.

6.3.3.1.7 On event recorder verify the following:

LGC WARNING is OFF (GG 9001)
ISS WARNING is OFF (GG 9002)
PGNCS CAUTION is OFF (GG 9003)

6.3.3.1.8 On CRT, verify all IMU gimbal angles indicate between 358 and 002.

6.3.3.1.9 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.4 Temperature Control Verification

6.3.4.1 When 15 minutes have elapsed from the time of IMU OPERATE power turn-on record PIPA TEMP (GG 2300). The PIPA TEMP shall be within 0.5° of the PIPA TEMP measured in 6.3.1.3.4.

6.3.4.2 When 30 minutes have elapsed from the time of IMU OPERATE power turn-on record IRIG TEMP (GG 2301).

6.3.4.3 When 1 hour has elapsed from the time of IMU OPERATE power turn-on, monitor PIPA TEMP (GG 2300) and IRIG TEMP (GG 2301) on the CRT. Monitor and record temperature readings every 5 minutes for 30 minutes. Verify that each reading does not deviate from the average value of each signal by more than 0.1°F.

6.3.4.4 The PIPA Temp shall be 130.5 (±1.5)°F. The IRIG TEMP shall be 135 (±2.5°)F.

6.3.4.5 The PIPA TEMP recorded in step 6.3.4.4 shall be within 1.0°F of the temperature recorded in steps 6.3.1.3.4 and within 0.5°F of the PIPA TEMP recorded in 6.3.4.1.

6.3.4.6 The IRIG TEMP recorded in step 6.3.4.4 shall be within 0.5°F of the temperature recorded in step 6.3.4.2.

6.3.5 PGNCS Power Supply Tests

6.3.5.1 From the CRT, confirm power supply voltages (or temperatures) are as specified and record values observed.

6.3.5.2 The PIPA Calibration Module Temperature (GG 6020) shall be between +45 and +90 DEG F.

6.3.5.3 The PSA Temperature (GG 6021) shall be between +60 and +110 DEG F.

6.3.5.4 The LGC Temperature (GG 4300) shall be between +45 and +130 DEG. F.

6.3.5.5 The +28 VDC IMU OPERATE BUS (GG 1500) shall be between 24.5 and 33.5 VDC.

6.3.5.6 The +28 VDC IMU STANDBY BUS (GG 1510) shall be between 24.5 and 33.5 VDC.

6.3.5.7 The +28 VDC LGC OPERATE BUS (GG 1520) shall be between 24.5 and 33.5 VDC.

6.3.5.8 The +120 VDC PIPA Supply (GG 1040) shall be between 114 and 126 VDC.

6.3.5.9 The -28 VDC Supply (GG 1100) shall be between -21.5 and -33.5 VDC.

6.3.5.10 The +4 VDC CDU Supply (GG 1070) shall be between 3.8 and 4.2 VDC.

6.3.5.11 The IMU 28V/800 CPS 1 pct Supply (GG 1201) shall be between 27,44 and 28.56 VRMS.

6.3.5.12 The IMU 28V 800 CPS 5 pct 90 PH Supply (GG 1202) shall be between 26.6 and 29.4 VRMS.

6.3.5.13 The IMU 28V 800 CPS 5 pct 0 PH Supply (GG 1203) shall be between 25.9 and 30.1 VRMS.

6.3.5.14 The 3.2 KC 28V Supply (GG 1331) shall be between 28.04 and 29.16 VRMS.

6.3.5.15 The 2.5 VDC T/M Bias (GG 1110) shall be between 2.4 and 2.6 VDC.

6.3.5.16 The +14 VDC LGC Supply (GG 1020) shall be between 13.6 and 14.4 VDC.

6.3.5.17 The +4 VDC LGC Supply (GG 1030) shall be between 3.8 and 4.2 VDC.

6.3.5.18 The phase difference between the 3.2 KC supply and LGC sync shall be 0±10° (NG 1336).

6.3.6 IMU OPERATIONAL TEST

6.3.6.1 On K-148 enter the following:

VERB 01 NOUN 10 ENTR
00003 ENTR
Record CRT DSKY Row 1 indication AAAAA and the time of day.

6.3.6.2 On K-148 enter the following:

VERB 21 NOUN 01 ENTR
03377 ENTR
AAAAA ENTR
VERB 06 NOUN 02 ENTR
03377 ENTR
Record CRT DSKY Row 1 indication as ±BBBBB

6.3.6.3 Perform the following calculations:

a. $\frac{\text{BBBBB} \times 5.12}{3600} = $ CCCC.C (Contents (hrs) of high order scalar register)

b. 23.3 - CCCC.C = DDDD.D hours

c. DDDD.D + time of day recorded in 6.3.6.1 = time of day at which high order scalar register will overflow.

6.3.6.4 If time of day is within 12 minutes of that calculated in 6.3.6.3.c when about to perform any of the following paragraphs, wait until that time calculated in 6.3.6.3.c has passed and proceed.

6.3.6.5 In K-148 enter the following sequence:

VERB 57 ENTR
00004 ENTR
VERB 34 ENTR

6.3.6.6 Wait 200 seconds, then verify on the CRT, that the X, Y and Z PIPA SG Output signals all indicate 0.0±2.5 Volts but not 0.

6.3.6.7 Approximately 12 minutes after performing step 6.3.6.1, VERB 06 NOUN 66 shall flash.

6.3.6.8 From the CRT, DSKY display, read and record R1 and R2 (local gravity whole and fractional respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.3.6.9 On K-148 enter the following sequence

VERB 33 ENTR
VERB 06 NOUN 66 shall flash.

6.3.6.10 From the CRT, DSKY display, read and record the horizontal fractional component of earth rate acting on the X, Y, and Z IRIG's as displayed in R2. The value recorded shall be between .77882 and .97882.

6.3.6.11 Terminate the test by entering in K-148 the following:

VERB 36 ENTR
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.7 PGNCS Operational Test

6.3.7.1 Start the PGNCS Operational test by inserting the following sequence into K-148:

VERB 57 ENTR
00010 ENTR
05 shall be displayed
VERB 33 NOUN 01 is displayed flashing

6.3.7.2 Command Accuracy 0°

6.3.7.2.1 On K-148, press ENTR
VERB 33 NOUN 02 is Displayed Flashing

On Event Module Verify ISS WARNING Lamp Lights
Press ENTR

VERB 33 NOUN 03 is Displayed Flashing.

6.3.7.2.2 Read and record the CRT IMU Gimbal angles. The indications shall be 000±001 degree.

6.3.7.2.3 Read and record CRT the DSKY Row 1, 2, and 3 indications. The indications shall be +00000 ± 00007.

6.3.7.3 Command Accuracy 45°.

6.3.7.3.1 On K-148, press ENTR, VERB 33 NOUN 04 is displayed flashing after approximately 20 seconds.

6.3.7.3.2 Read and record the CRT IMU Gimbal angle. The indications shall be 045 ± 001 degrees.

6.3.7.3.3 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be +04500 ± 00007.

6.3.7.4 CDU Repeating Accuracy 45°

6.3.7.4.1 On K-148 press ENTR. In about 90 seconds VERB 05 NOUN 30 is displayed flashing.

6.3.7.4.2 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be between 77774 and 00003.

6.3.7.5 Command Accuracy 90°.

6.3.7.5.1 On K-148 Press VERB 33, ENTR. In approximately 20 seconds VERB 33 NOUN 06 is displayed flashing. The GIMBAL LOCK lamp on DSKY shall be lighted.

6.3.7.5.2 Read and record the CRT IMU Gimbal angle. The indications shall be 090 ± 001 degrees.

6.3.7.5.3 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indication shall be +09000 ± 00007.

6.3.7.6 Command Accuracy 135°.

6.3.7.6.1 On K-148 press ENTR. In approximately 20 seconds VERB 33 NOUN 07 is displayed flashing.

6.3.7.6.2 Read and record the CRT IMU Gimbal Angle indication. The indications shall be 135 ± 001 degrees.

6.3.7.6.3 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be +13500 ± 00007.

6.3.7.7 On K-148 press ENTR. In approximately 20 seconds VERB 33 NOUN 10 is displayed flashing. The GIMBAL LOCK lamp on DSKY shall not be lighted.

6.3.7.8 CDU Repeating Accuracy 135°.

6.3.7.8.1 On K-148 press ENTR pushbutton. In about 90 seconds, VERB 05 NOUN 30 is displayed flashing.

6.3.7.8.2 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be between 77774 and 00003.

6.3.7.9 + Gimbal Lock Test

6.3.7.9.1 On K-148, Press VERB 33, ENTR. In approximately 20 seconds VERB 33 NOUN 12 is displayed flashing. The GIMBAL LOCK lamp on DSKY shall be lighted.

6.3.7.10 Command Accuracy 225°.

6.3.7.10.1 On K-148 press ENTR. In approximately 20 seconds, VERB 33, NOUN 13 is displayed flashing.

6.3.7.10.2 Read and record the CRT IMU Gimbal Angle indications. The indication shall be 225±001 degrees.

6.3.7.10.3 Read and record CRT DSKY Rows 1, 2, and 3 indications. The indications shall be +225 00 ± 00007.

6.3.7.11 On K-148 press ENTR. In approximately 20 seconds VERB 33 NOUN 14 is displayed. The GIMBAL LOCK lamp shall not be lighted.

6.3.7.12 CDU Command Rate Test

6.3.7.12.1 On K-148 press ENTR. In approximately 30 seconds VERB 06 NOUN 66 is displayed flashing. The GIMBAL LOCK lamp on DSKY shall be lighted.

6.3.7.12.2 Read and record the CRT DSKY Row 1, 2, and 3 indications. The indication shall be between 00012 and 00016.

6.3.7.12.3 On K-148 insert VERB 33 ENTR. In approximately 30 seconds VERB 06 and NOUN 66 is displayed flashing. Repeat 6.3.7.12.2. The GIMBAL LOCK lamp on DSKY shall not be lighted.

6.3.7.12.4 On K-148 insert VERB 33 ENTR. In approximately 30 seconds VERB 06 and NOUN 66 is displayed flashing. Repeat 6.3.7.12.2. The GIMBAL LOCK lamp on the DSKY shall not be lighted.

6.3.7.13 Command Accuracy 315°.

6.3.7.13.1 On K-148 insert VERB 33 ENTR. In approximately 20 seconds VERB 33 NOUN 20 will be displayed flashing.

6.3.7.13.2 Read and record CRT IMU Gimbal Angles. The indicator shall be 315±001 degrees.

6.3.7.13.3 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be +31500±00007.

6.3.7.14 CDU Repeating Accuracy 315°.

6.3.7.14.1 On K-148 press ENTR. In approximately 90 seconds VERB 05 NOUN 30 is displayed flashing.

6.3.7.14.2 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be between 77774 and 00003.

6.3.7.15 -Gimbal Lock Test

6.3.7.15.1 On K-148 Press VERB 33 ENTR. In approximately 20 seconds VERB 33, NOUN 22 is displayed flashing. The GIMBAL LOCK lamp on DSKY shall be lighted.

6.3.7.15.2 On K-148 Press ENTR. In approximately 20 seconds VERB 33 NOUN 23 will be displayed flashing.

6.3.7.15.3 Read and record the CRT DSKY Rows 1, 2 and 3 indications. The indications shall be:

Row 1	22500±00007
Row 2	22500±00007
Row 3	00000±00000

6.3.7.16 CDU Repeating Accuracy 225°.

6.3.7.16.1 On K-148 press ENTR. In above 90 seconds, VERB 05 NOUN 30 is displayed flashing.

6.3.7.16.2 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indication shall be between 77774 and 00003.

6.3.7.17 On K-148 Press VERB 33 ENTR. The GIMBAL LOCK lamp shall not be lighted. VERB 21, NOUN 22 is displayed flashing.

6.3.7.18 IMU CDU Fine Fail Test

6.3.7.18.1 On K-148 insert the following sequence
+00100 ENTR
+00100 ENTR
+00100 ENTR
On Event Module verify that ISS WARNING lamp lights.

6.3.7.18.2 After approximately 20 seconds, VERB 01 NOUN 10 shall be displayed. Verify that CRT DSKY display Row 1 indicates 33XXX or 32XXX.

6.3.7.19 IMU CDU Coarse Fail Test

6.3.7.19.1 On K-148 insert the following sequence

VERB 33 ENTR
+03750 ENTR
+03750 ENTR
+03750 ENTR
Verify that ISS WARNING lamp Event Module lights.

6.3.7.19.2 After approximately 20 seconds, VERB 01 NOUN 10 shall be displayed. Verify that CRT DSKY display of Row 1 indicates 33XXX or 32XXX.

6.3.7.20 FDAI Linearity Test

6.3.7.20.1 On K-148 enter VERB 33 ENTR
VERB 33 NOUN 27 shall be displayed.

6.3.7.20.2 On CRT verify the following:

PITCH ATT ERROR is between +15.3 and +18.7 DEG (GG 2219)
YAW ATT ERROR is between +15.3 and +18.7 DEG (GG 2249)
ROLL ATT ERROR is between +15.3 and +18.7 DEG (GG 2279)

6.3.7.20.3 On K-148 press ENTR.
VERB 33 NOUN 30 shall be displayed.

6.3.7.20.4 On CRT verify the following:

PITCH ATT ERROR is between +14.4 and +17.6 DEG (GG 2219)
YAW ATT ERROR is between +14.4 and +17.6 DEG (GG 2249)
ROLL ATT ERROR is between +14.4 and +17.6 DEG (GG 2279)

6.3.7.20.5 On K-148 press ENTR.
VERB 33 NOUN 31 shall be displayed

6.3.7.20.6 On CRT verify the following:

PITCH ATT ERROR is between +05.4 and +06.6 DEG (GG 2219)
YAW ATT ERROR is between +05.4 and +06.6 DEG (GG 2249)
ROLL ATT ERROR is between +05.4 and +06.6 DEG (GG 2279)

6.3.7.20.7 On K-148 press ENTR.
VERB 33 NOUN 32 shall be displayed.

6.3.7.20.8 On CRT verify the following:

PITCH ATT ERROR is between +00.2 and -00.2 DEG (GG 2219)
YAW ATT ERROR is between +00.2 and -00.2 DEG (GG 2249)
ROLL ATT ERROR is between +00.2 and -00.2 DEG (GG 2279)

6.3.7.20.9 On K-148 press ENTR.
VERB 33 NOUN 33 shall be displayed.

6.3.7.20.10 On CRT verify the following:

PITCH ATT ERROR is between -05.4 and -06.6 DEG (GG 2219)
YAW ATT ERROR is between -05.4 and -06.6 DEG (GG 2249)
ROLL ATT ERROR is between -05.4 and -06.6 DEG (GG 2279)

6.3.7.20.11 On K-148 press ENTR.
VERB 33 NOUN 34 shall be displayed.

6.3.7.20.12 On CRT verify the following:

PITCH ATT ERROR is between -14.4 and -17.6 DEG (GG 2219)
YAW ATT ERROR is between -14.4 and -17.6 DEG (GG 2249)
ROLL ATT ERROR is between -14.4 and -17.6 DEG (GG 2279)

6.3.7.20.13 On K-148 press ENTR.
VERB 33 NOUN 35 shall be displayed.

6.3.7.20.14 On CRT verify the following:

PITCH ATT ERROR is between -15.3 and -18.7 DEG (GG 2219)
YAW ATT ERROR is between -15.3 and -18.7 DEG (GG 2249)
ROLL ATT ERROR is between -15.3 and -18.7 DEG (GG 2279)

6.3.7.21 On K-148 enter VERB 36 ENTR.

The proper operation of the IMU CAGE function (consisting of steps 6.3.7.21 thru 6.3.7.23) need be performed only once during the initial PGNCS Operational Test and omitted from subsequent testing of test 6.3.7.

6.3.7.21.1 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00500 ENTR
+00500 ENTR
+00500 ENTR

6.3.7.21.2 On the CRT, verify all IMU gimbal angles indicate between 003 and 007 DEG.

6.3.7.21.3 On analog recorder, monitor the following signals:

SIGNAL NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2106	IG Servo Error Total
c. GG 2166	OG Servo Error Total
d. GG 2112	IG 1X Resolver Sine
e. GG 2172	OG 1X Resolver Sine
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1φ 800 cps

6.3.7.21.4 Start analog recorder to a chart speed of 5 mm/sec.

6.3.7.21.5 On LEM Cabin Panel 4, hold IMU CAGE momentary toggle switch in the ON position. (Do not release).

6.3.7.21.6 On analog recorder, verify the 1X Resolver Sine signals (GG 2112, GG 2172, GG 2142) null out to less than 0.5 VRMS. Release IMU CAGE switch to the OFF position. Disregard any momentary transients on the 1X Resolver Sine signals when the switch is released. Any sustained oscillations shall be cause for immediate removal of IMU Operate power.

6.3.7.21.7 On the CRT, verify all IMU gimbal angles indicate between 358 and 002.

6.3.7.22 Stop analog recorder.

6.3.7.23 On K-148 enter the following sequence:

VERB 36		ENTR
VERB 41	NOUN 20	ENTR
+00700		ENTR
+00700		ENTR
+00700		ENTR

6.3.7.24 On CRT verify the following:

IG 1X Resolver Sin (11°) is between +5.5 and +8.5 DEG (GG 2121)
MG 1X Resolver Sin (11°) is between +5.5 and +8.5 DEG (GG 2151)
OG 1X Resolver Sin (11°) is between +5.5 and +8.5 DEG (GG 2181)

6.3.7.25 On K-148 enter the following:

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

6.3.8 IRIG Scale Factor Determination

6.3.8.1 Insure that the IMU operate power and LGC Operate power have been applied for a minimum of one hour and that the IMU is not in a gimbal lock condition.

6.3.8.2 On meter module monitor and record IRIG TEMP (GG2301) and PIPA TEMP (GG2300).

6.3.8.3 On K-148 enter the following sequence.

VERB 57 ENTR
00005 ENTR

6.3.8.4 PROG 05 shall be displayed.

6.3.8.5 VERB 06 NOUN 61 shall flash.

6.3.8.6 On the CRT DSKY, verify contents of Row 1 (Navigation Base Azimuth) and Row 2 (Site latitude shall be displayed).

6.3.8.7 If values for Row 1 and Row 2 are correct, proceed to the next step. If values for Row 1 and Row 2 are incorrect, enter the following sequence into K-148:

VERB 24 ENTR
±xxxxx ENTR (Correct navigation base azimuth)
+28.516 ENTR (Correct site latitude)
Verify values in Row 1 and Row 2 are correct.

6.3.8.8 On K-148 enter the following sequence:

VERB 33 ENTR (VERB 21 NOUN 30 shall flash)
+00001 ENTR
NOTE: If PROG lamp changes from 05 to 00 during next step or PROG ALARM is on, enter VERB 36 ENTR and repeat steps 6.3.8.3 through 6.3.8.8.

6.3.8.9 In approximately 200 seconds VERB 06 NOUN 66 shall flash. Read and record from CRT DSKY Row 1 (-X IRIG Scale Factor error in part per million, Position +00001)

6.3.8.10 On K-148 enter the following sequence:

VERB 33 ENTR (VERB 21 NOUN 30 shall flash)
+00002 ENTR

NOTE: If PROG lamp changes from 05 to 00 during next step or PROG ALARM lamp is on, enter VERB 36 ENTR and repeat steps 6.3.8.3 through 6.3.8.7 and 6.3.8.10.

6.3.8.11 In approximately 200 seconds VERB 06 NOUN 66 shall flash. Read and record from CRT DSKY Row 1 (-Y IRIG Scale Factor error in parts per million Position +00002).

6.3.8.12 On K-148 enter the following sequence:

VERB 33 ENTR (VERB 21 NOUN 30 shall flash)
+00003 ENTR

NOTE: If PROG lamp changes from 05 to 00 during the next step, or PROG ALARM lamp is ON, enter VERB 36 ENTR and repeat steps 6.3.8.3 through 6.3.8.7 and 6.3.8.12.

6.3.8.13 In approximately 200 seconds VERB 06 NOUN 66 shall flash. Read and record from CRT DSKY Row 1 (+Z IRIG Scale Factor error in parts per million, Position +00003).

6.3.8.14 On K-148 enter the following sequence:

VERB 33 ENTR (VERB 21 NOUN 30 shall flash)
-00001 ENTR

NOTE: If PROG lamp changes from 05 to 00 during the next step, or PROG ALARM lamp is on, enter VERB 36 ENTR and repeat steps 6.3.8.3 through 6.3.8.7 and 6.3.8.14.

6.3.8.15 In approximately 200 seconds, VERB 06 NOUN 66 shall flash. Read and record from CRT DSKY Row (+X IRIG Scale Factor error in parts per million, Position -00001).

6.3.8.16 On K-148 enter the following sequence:

VERB 33 ENTR (VERB 21 NOUN 30 shall flash)
-00002 ENTR
NOTE: If PROG lamp changes from 05 to 00 during the next step, or PROG ALARM lamp is ON, enter VERB 36 ENTR and repeat steps 6.3.8.3 through 6.3.8.7 and 6.3.8.16.

6.3.8.17 In approximately 200 seconds, VERB 06 NOUN 66 shall flash. Read and record from CRT DSKY Row 1 (+Y IRIG Scale Factor error in parts per million, Position -00002).

6.3.8.18 On K-148 enter the following sequence:

VERB 33 ENTR (VERB 21 NOUN 30 shall flash)
-00003 ENTR
NOTE: If PROG lamp changes from 05 to 00 during the next step, or PROG ALARM is ON, enter VERB 36 ENTR and repeat steps, 6.3.8.3 through 6.3.8.7 and 6.3.8.18.

6.3.8.19 In approximately 200 seconds, VERB 06 NOUN 66 shall flash. Read and record from CRT DSKY Row 1 (-Z IRIG Scale Factor error in parts per million, Position -00003).

6.3.8.20 Repeat steps 6.3.8.8 through 6.3.8.19 twice to obtain second and third set of data.

6.3.8.21 Terminate this test by entering in K-148 the following:

VERB 34 ENTR
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.8.22 The average of the three readings of Scale Factor Error for each of the 6 positions shall be 0 ± 1750 PPM.

6.3.9 IMU performance Test. A reference data sheet is provided at the end of this section to aid in data reduction.

6.3.9.1 Insure that IMU Operate power and LGC Operate power has been applied for a minimum of one hour and that the IMU is not in a Gimbal Lock condition.

6.3.9.2 On CRT display, monitor and record IRIG TEMP (GG 2301) and PIPA TEMP (GG 2300).

6.3.9.3 Adjust oscilloscope to display butterfly of X PIPA.

6.3.9.4 On K-148 enter the following:

VERB 01 NOUN 10 ENTR
00003 ENTR
Record CRT DSKY Row 1 indication AAAAA and the time of day.

6.3.9.5 On K-148 enter the following:

VERB 21 NOUN 01 ENTR
03377 ENTR
AAAAA ENTR
VERB 06 NOUN 02 ENTR
03377 ENTR
Record CRT DSKY Row 1 indications as ±BBBBB.

6.3.9.6 Perform the following calculations:

a. $\frac{\text{BBBBB} \times 5.12}{3600}$ = CCCC.C (Contents (hrs) of high order scalar register)

b. 23.3 - CCCC.C = DDDD.D hours.

c. DDDD.D + present time of day = time of day at which high order scalar register will overflow.

6.3.9.7 If the time of day is within 12 minutes of that calculated in 6.3.9.6.c when about to perform any of the following paragraphs, wait until that time calculated in 6.3.9.6.c has passed and proceed.

Paragraph
6.3.9.15
6.3.9.22
6.3.9.30
6.3.9.36
6.3.9.43
6.3.9.48

6.3.9.8 On K-148 enter the following sequence:

VERB 01 NOUN 01 ENTR
00366 ENTR
Record contents of Row 1 XXXXY
VERB 21 NOUN 01 ENTR
00366 ENTR
XXXXY' ENTR
Where Y' is obtained from Table II.
VERB 57 ENTR
00001 ENTR
VERB 06 NOUN 61 shall flash

6.3.9.9 On the CRT, DSKY display verify R1 (Navigation Base Azimuth) and R2 (Site Latitude) are correct.

6.3.9.10 If values for R1 and R2 are correct, proceed to next step. If values for R1 and R2 are incorrect, enter the following sequence into K-148.

VERB 24 ENTR
±xxx.xx ENTR (Correct navigation base azimuth ±0.50 deg)
+28.516 ENTR (Correct site latitude)
Verify values in R1 and R2 are correct

6.3.9.11 On K-148 enter the following sequence:

VERB 33 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.12 On CRT, DSKY display, verify R1 = +00600 (Time), R2 = +00000 (Test Index No.) and R3 = +00001 (Test Position). If values for R1, R2 and R3 are correct, proceed to next step. If values for R1, R2 and R3 are incorrect, enter the following sequence into K-148:

VERB 25 ENTR
+00600 ENTR (Test Time in Seconds)
+00000 ENTR (Test Index Number)
+00001 ENTR (Test Position Entry)

6.3.9.13 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.14 In approximately 12 minutes, VERB 06 NOUN 66 shall flash. From the CRT, DSKY display, record R2 (+NBDY Position +00001).

6.3.1.15 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.16 After 100 seconds, take a photograph of Y and Z PIPA butterfly patterns on oscilloscope.

6.3.9.17 In approximately 5 minutes, VERB 06 NOUN 66 shall flash. From the CRT, record R1 and R2 (+X PIPA Position +00001). Row 1 is whole part, Row 2 is fractional part. Units are cm/sec^2.

6.3.9.18 On K-148 enter the following sequence:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.19 On CRT, DSKY display - verify R1 = +00600, R2 = +00000, and R3 = +00002

6.3.9.20 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.21 In approximately 12 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R2 (+NBDZ Position +00002).

6.3.9.22 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.23 Approximately 5 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R1 and R2 (-X PIPA Position +00002).

6.3.9.24 On K-148 enter the following sequence:

VERB 33 ENTR
Record CRT gimbal angle indications and time.

6.3.9.25 In approximately 67 minutes, VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R2 (-NBDX + ADIAX Pos +00002). Record CRT gimbal angle indications and time.

6.3.9.26 On K-148 enter the following sequence:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.27 On CRT, DSKY display, verify R1 = +00600, R2 = +00000, and R3 = +00003.

6.3.9.28 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.29 In approximately 12 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R2 (-NBDX Position +00003).

6.3.9.30 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.31 In approximately 5 minutes, VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R1 and R2 (+Z PIPA Position +00003).

6.3.9.32 On K-148 enter the following sequence:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash.

6.3.9.33 On the CRT, DSKY display verify R1 = +00600, R2 = 00000, and R3 = +00004.

6.3.9.34 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.35 In approximately 12 minutes, VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R2 (+NBDY + ADSRAY Position +00004).

6.3.9.36 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.37 After 100 seconds, take a photograph of the X -PIPA butterfly pattern on oscilloscope.

6.3.9.38 In approximately 5 minutes, VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R1 and R2 (-Z PIPA Position +00004).

6.3.9.39 On K-148 enter the following sequence:

VERB 33 ENTR
Record CRT gimbal angle indications and time.

6.3.9.40 In approximately 67 minutes VERB 06 NOUN 66 shall flash. From the CRT DSKY display record R2 (+NBDZ + ADIAZ Position +00004). Record CRT gimbal angle indications and time.

6.3.9.41 On K-148 enter the following sequence:

VERB 33 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.42 From the CRT, DSKY display verify R1 = +00600, R2 = +00000 and R3 = +00005.

6.3.9.43 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.44 The PROG alarm and GIMBAL LOCK lamps shall light. Press Error Reset.

6.3.9.45 In approximately 5 minutes, VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R1 and R2 (+Y PIPA Position +00005).

6.3.9.46 On K-148 enter the following sequence:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.47 On the CRT, DSKY display verify R1 = +00600, R2 = +00000 and R3 = +00006.

6.3.9.48 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.49 The PROG alarm and GIMBAL LOCK lamps shall light. Press Error Reset.

6.3.9.50 In approximately 5 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R1 and R2. (-Y PIPA Position +00006).

6.3.9.51 On K-148 enter the following sequence:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.52 On the CRT, DSKY display, verify R1 = +00600, R2 = +00000 and R3 = +00007.

6.3.9.53 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.54 In approximately 12 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R2 (+.707 ADSRAX - NBDX Position +00007).

6.3.9.55 On K-148 enter the following sequence:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.56 On the CRT, DSKY display, verify R1 = +00600, R2 = +00000, and R3 = +00008.

6.3.9.57 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.58 In approximately 12 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display, record R2 -.707 (NBDZ+NBDY) +0.5 (ADSRAY + ADSRAZ) +0.5 (ADIAZ - ADIAY) (Position +00008).

6.3.9.59 On K-148 enter the following:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash.

6.3.9.60 On the CRT, DSKY display, verify R1 = +00600, R2 = +00000, and R3 = +00009.

6.3.9.61 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.62 In approximately 12 minutes VERB 06 NOUN 66 shall flash. From the CRT DSKY display, record R2 (-NBDZ + .707 ADSRAZ Position +00009).

6.3.9.63 On K-148 enter the following sequence:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.64 On the CRT, DSKY display, verify R1 = +00600, R2 = +00000, and R3 = +00010.

6.3.9.65 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.66 In approximately 12 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R2 [.707 (NBDY-NBDX) +.5 (ADIAY - ADIAX) +.5 ADSRAX] (Position +00010).

6.3.9.67 Terminate this test by entering in K-148 the following:

VERB 36 ENTR

6.3.9.68 On CRT, record IRIG TEMP (CG 2301) and PIPA TEMP(CG 2300).

6.3.9.69 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.9.70 Calculations,
NOTE: Use Post Vibration or System Test data points only.

6.3.9.70.1 Obtain data from last IRIG and/or PIPA test and fill in Data Sheet x_{i-1}.

6.3.9.70.2 Obtain data from second last IRIG and/or PIPA test and fill in Data Sheet x_{i-2}.

6.3.9.70.3 Obtain data from third last IRIG and/or PIPA test and fill in Data Sheet x_{i-3}.

6.3.9.70.4 Perform the following calculations for each item appearing on Data Sheet x_i and transfer all results to lines au through bi.

NOTE:

See paragraph 5.6 before continuing.

$$D_1 = \left| X_{i-1} - x_i \right|$$

$$D_2 = \left| x_{i-1} - x_i \right| + \left| x_{i-2} - x_{i-1} \right|$$

$$D_3 = \left| x_{i-3} - x_{i-2} \right| + \left| x_{i-2} - x_{i-1} \right| + \left| x_{i-1} - x_i \right|$$

DATA SHEET

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.3.9. 14	+N BDY Transfer result to line af.	meru	( ) ---.--	a
6.3.9. 17	+ X PIPA Test Position +00001	cm/sec^2	( ) 00---. ( ) -----	b
6.3.9. 21	+N BDZ Position +00002 Transfer result to line ag	meru	( ) ---.--	c
6.3.9 23	-X PIPA Test Position +00002	cm/sec^2	( ) 00---. ( ) -----	d
6.3.9. 25	-N BDX + ADIAX Position +00002	meru	( ) ---.--	e
6.3.9 29	-N BDX Position +00003 Multiply by-1 and transfer result to line ah.	meru	( ) ---.--	f
6.3.9. 31	+Z PIPA Test Position +00003	cm/sec^2	( ) 00---. ( ) -----	g
6.3.9 35	+N BDY + ADSRAY Position +00004	meru	( ) ---.--	h
6.3.9. 38	-Z PIPA Test Position +00004	cm/sec^2	( ) 00---. ( ) -----	i
6.3.9. 40	+N BDZ + ADIAZ Position +00004	meru	( ) ---.--	j
6.3.9. 45	+Y PIPA Test Position +00005	cm/sec^2	( ) 00---. ( ) -----	k
6.3.9. 50	-Y PIPA Test Position +00006	cm/sec^2	( ) 00---. ( ) -----	l
6.3.9. 54	-NBDX + .707 ADSRAX Position +00007	meru		m
6.3.9. 58	-.707 (NBDZ+NBDY) +0.5 (ADIAZ-ADIAY) +0.5 (ADSRAY+ADSRAZ) Position +00008	meru		n
6.3.9 62	-NBDZ + .707 ADSRAZ Position +00009	meru		o
6.3.9. 66	.707 (NBDY-NBDX +.5 (ADIAY-ADIAX) +.5 ADSRAX Position +00010	meru		p

DATA SHEET

CALCULATION	PARAMETER	UNITS	
line c - line f = ( ) ---.-- (-NBDX+ADIAX) - (-NBDX) Transfer result to line al.	ADIAX	meru	q
line h - line a = ( ) ---.-- (+NBDY+ADSRAY) - (-NBDY) Transfer result to line ai.	ADSRAY	meru	r
line j - line c = ( ) ---.-- (+NBDZ+ADIAZ) - (NBDZ) Transfer result to line am.	ADIAX	meru	s
(line m - line f) X1.414 = ( ) ---.-- (-NBDX + .707 ADSRAX) -(-NBDX) X 1.414 Transfer result to line ak.	ADSRAX	meru	t
(line o + line c) X1.414 = ( ) ---.-- (-NBDZ + .707 ADSRAZ + NBDZ) X 1.414 Transfer result to line aj.	ADSRAZ	meru	u
(line p - .707 line a - .707 line f +.5 line q -.5 line t) X2 = ---.-- [.707 (NBDY-NBDX) +.5 (ADIAY-ADIAX) +.5 ADSRAX -.707 (-NBDX) -.707 NBDY +.5 ADIAX - .5 ADSRAX] X2 Transfer result to line an.	ADIAY	meru	v
line b - line d = ( )	PIPA X2G	cm sec^2	w
line k - line l = ( )	PIPA Y2G	cm/sec^2	x
line g - line i = ( )	PIPA Z2G	cm/sec^2	y
1958.48 ÷ line w x 1 cm/sec pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ao.	X PIPA S. F.	cm/sec/ pulse	z
1958.48 ÷ line x X1cm/sec/pulse = Subtract 1.000000 from this value, multiply X10^6 and transfer results to line ap.	Y PIPA S. F.	cm/sec/ pulse	aa
1958.48 ÷ line y X 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply X10^6 and transfer results to line aq.	Z PIPA S. F.	cm/sec/ pulse	ab
1/2 (line b + line d) = ( ) --.--- Transfer results to line ar.	X PIPA Bias	cm/sec^2	ac
1/2 (line k + line l) = ( ) --.--- Transfer results to line as.	Y PIPA Bias	cm/sec^2	ad
1/2 (line g + line i) = ( ) --.--- Transfer results to line at.	Z PIPA Bias	cm/sec^2	ae

DATA SHEET
(x_1)

PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
NBDY	meru	-15		+15			af
NBDZ	meru	-15		+15			ag
NBDX	meru	-15		+15			ah
ADSRAY	meru	-40		+40			ai
ADSRAZ	meru	-40		+40			aj
ADSRAX	meru	-40		+40			ak
ADIAX	meru	-100		+100			al
ADIAZ	meru	-100		+100			am
ADIAY	meru	-100		+100			an
X PIPA S. F. error from line z	PPM	-1900		+1900			ao
X PIPA S. F. error from line aa	PPM	-1900		+1900			ap
Z PIPA S. F. error from line ab	PPM	-1900		+1900			aq
X PIPA Bias from line ac	cm/sec^2	-3.1		+3.1			ar
X PIPA Bias from line ad	cm/sec^2	-3.1		+3.1			as
Z PIPA Bias from line ae	cm/sec^2	-3.1		+3.1			at

DATA SHEET
(x_{1-1})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru	
ADSRAZ	meru	
ADSRAX	meru	
ADIAX	meru	
ADIAZ	meru	
ADIAY	meru	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET
(x_{1-2})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru	
ADSRAZ	meru	
ADIAX	meru	
ADIAZ	meru	
ADIAY	meru	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET

(X4-3)

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru	
ADSRAZ	meru	
ADSRAX	meru	
ADIAX	meru	
ADIAZ	meru	
ADIAY	meru	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET

PARAMETER	UNITS	D_1	MAX	D_2	MAX	D_3	MAX	
NBDY	meru		6		9		11	au
NBDZ	meru		6		9		11	av
NBDX	meru		6		9		11	aw
ADSRAY	meru		14		21		25	ax
ADSRAZ	meru		14		21		25	ay
ADSRAX	meru		14		21		25	az
ADIAX	meru		17		33		40	ba
ADIAZ	meru		17		33		40	bb
ADIAY	meru		17		33		40	bc
X PIPA S. F.	Error PPM		400		500		600	bd
Y PIPA S. F.	Error PPM		400		500		600	be
Z PIPA S. F.	Error PPM		400		500		600	bf
X PIPA Bias	cm/sec^2		0.5		0.7		0.9	bg
Y PIPA Bias	cm/sec^2		0.5		0.7		0.9	bh
Z PIPA Bias	cm/sec^2		0.5		0.7		0.9	bi

Y	Y'
0	2
1	3
2	2
3	3
4	6
5	7
6	6
7	7

TABLE II

6.3.10 **LGC Voltage Margin Test**

6.3.10.1 **Initial Conditions**

6.3.10.1.1 Insure that the G&N System is in the Standby Mode.

6.3.10.1.2 On the CRT, verify the +28 VDC LGC OPERATE bus is between 24.5 and 33.5 vdc (GG 1520).

6.3.10.2 **Voltage Margin Determination**

6.3.10.2.1 On the PSA Adapter Module (PSAAM) (410-31080), place INHIBIT VOLTAGE FAIL switch to ON.

CAUTION: The +4 vdc LGC Supply voltage shall never be operated lower than +2.5 vdc or higher than +5.2 vdc (GG 1030).

The +14 vdc LGC Supply shall never be operated less than +8.5 vdc or higher than +17.0 vdc (GG 1020).

NOTE: The flashing indication of the LGC supplies may be disregarded for this test. The charts in Table III may be used to determine approximate values for the "XX.X" values of C-156 voltage dial settings corresponding to various power supply voltages.

6.3.10.2.2 Enter 0001 into R155. Verify and execute.

6.3.10.2.3 Enter 1111 into R154, Verify and execute.

6.3.10.2.4 Enter in C-156 ±XX.X001114. (Enter a value for XX.X which will adjust the +14V power supply (GG 1020) as monitored on the CRT, to 12.1 (+0.1, -0.0) vdc. See Table III. Execute.

6.3.10.2.5 Enter in C-156 ±XX.X001124 (Enter a value for XX.X which will adjust the +4V power supply (GG 1030) as monitored on the CRT, to 3.4 (+0.03, -0.0) vdc. See Table III. Execute.

6.3.10.2.6 On K-148 press ERROR RESET.

6.3.10.2.7 On K-148 initiate LGC Self-Check by entering the following:

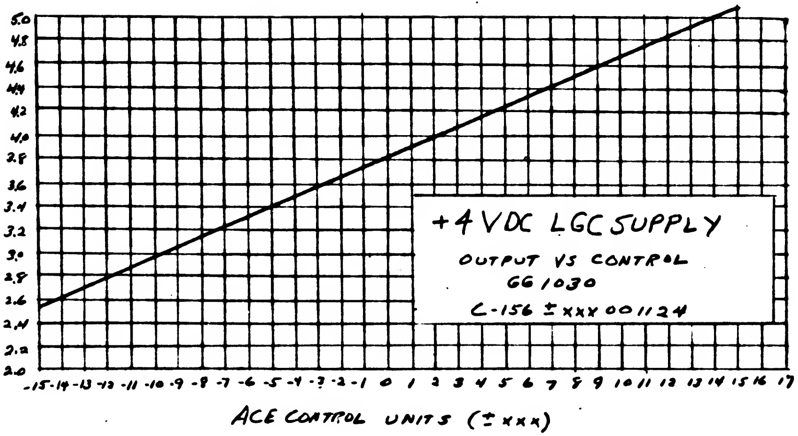
VERB 21 NOUN 27 ENTR
77767 ENTR

Wait 200 seconds. Verify RESTART lamp on the DSKY is not lit.

6.3.10.2.8 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lighted.

6.3.10.2.9 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL switch to ON. Press ERROR RESET. Perform the following DSKY operations:

VERB 21 NOUN 27 ENTR
77767 ENTR


+4 VDC LGC SUPPLY
OUTPUT VS CONTROL
GG 1030
C-156 ± xxx 001124
5.0
4.8
4.6
4.4
4.2
4.0
3.8
3.6
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
ACE CONTROL UNITS (± xxx)

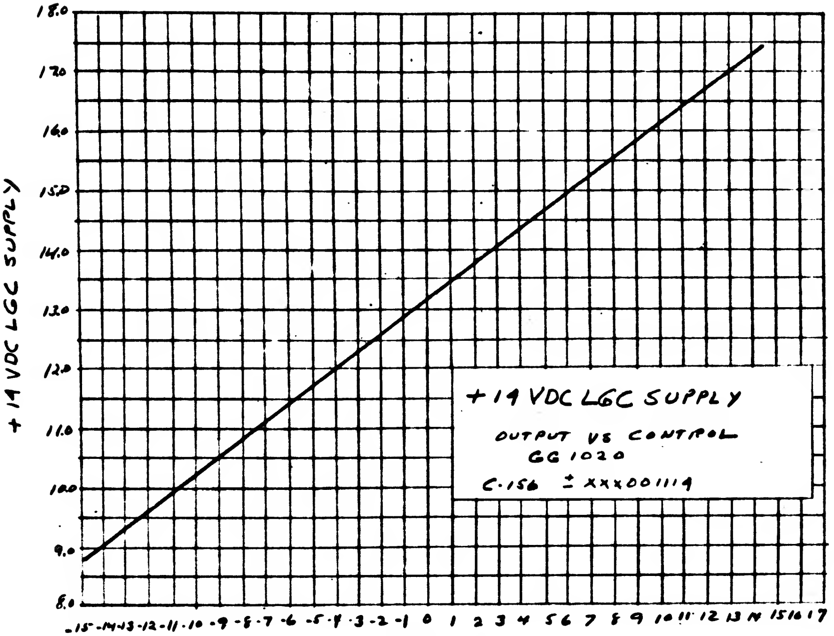

+14 VDC LGC SUPPLY
OUTPUT VS CONTROL
GG 1020
C-156 ± xxx 001114
18.0
17.0
16.0
15.0
14.0
13.0
12.0
11.0
10.0
9.0
8.0
+14 VDC LGC SUPPLY
-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

TABLE III

6.3.10.2.10 Enter in C-156 (±) XX.X001114 (Enter a value for XX.X which will adjust the +14V power supply (GG 1020) as monitored on the CRT, to 16.4 (+0.0, -0.1) vdc. See Table III Execute.

6.3.10.2.11 On K-148 press ERROR RESET. Wait 200 seconds. Verify RESTART lamp on DSKY is not lighted.

6.3.10.2.12 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lighted. Set the INHIBIT VOLTAGE FAIL switch to ON. Press ERROR RESET. Perform the following DSKY operations.

```
VERB 21  NOUN 27  ENTR
77767             ENTR
```

6.3.10.2.13 Enter in C-156 ±XX.X001124 (Enter a value for XX.X which will adjust the 4V power supply (GG 1030) as monitored on the CRT, to 4.6 (+0,0,-0.03) vdc. See Table III. Execute.

6.3.10.2.14 On K-148 press ERROR RESET. Wait 200 seconds. Verify RESTART lamp on DSKY is not lit.

6.3.10.2.15 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL Switch to OFF. Verify RESTART lamp on the DSKY is lit. Set the INHIBIT VOLTAGE FAIL switch to ON. Press ERROR RESET. Perform the following DSKY operations:

```
VERB 21  NOUN 27  ENTR
77767             ENTR
```

6.3.10.2.16 Enter in C-156 (±) XX.X001114 (Enter a value for XX.X which will adjust the 14V power supply (GG 1020) as monitored on the CRT, to 12.1 (+0.1, -0.0) vdc. See Table III. Execute.

6.3.10.2.17 On K-148 press ERROR RESET. Wait 200 seconds. Verify RESTART lamp on DSKY is not lighted.

6.3.10.2.18 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lighted.

6.3.10.2.19 On R-154 enter 0000. Execute.

6.3.10.2.20 On R-155 enter 0000. Execute.

6.3.10.2.21 On K-148 terminate the LGC Self-Check by entering the following:

```
VERB 21    NOUN 27     ENTR
00000                  ENTR
```

6.3.10.2.22 On K-148 press ERROR RESET.

6.3.11 **LGC Clock Frequency Test**

6.3.11.1 Insure that LGC Operate power has been applied for a minimum of 10 minutes before performing this test.

6.3.11.2 Verify that the counter is connected to the 3.2 kc signal on the hardline.

6.3.11.3 Insure that the counter has been warming up for a minimum of 30 minutes.

6.3.11.4 On the counter,

Set the FUNCTION switch to: MAN START
Set the TIME BASE switch to: 1 usec TIME UNIT/COUNT
Set the SENSITIVITY control to: CHECK

6.3.11.5 Verify proper counter operation.

6.3.11.6 Set the FUNCTION switch to REMOTE OR TIME INTERVAL.

6.3.11.7 Plug in the Preset unit and set:

MODE switch to PRESET
N switches to 96000

6.3.11.8 Turn SAMPLE RATE control fully clockwise (HOLD). Wait 35 seconds for counter display to fill.

6.3.11.9 Start counting by depressing RESET switch on counter.

6.3.11.10 After approximately 30 seconds, read and record counter display.

6.3.11.11 Repeat steps 6.3.11.9 and 6.3.11.10 nine times

6.3.11.12 The average of the 10 previous readings shall be 30.000000±0.000060 seconds.

6.3.11.13 Insure that the System is not in IMU Operate.

6.3.11.14 Perform the following DSKY operations.

VERB 21 NOUN 10 ENTR
00013 ENTR
02000 ENTR

Press and hold the STBY pushbutton on the DSKY for 3 seconds. Verify the Standby lamp is lighted.

6.3.11.15 Repeat steps 6.3.11.9 through 6.3.11.12.

6.3.11.16 Press and hold the STBY pushbutton on the DSKY for 3 seconds. Verify the Standby lamp is not lighted.

6.3.11.17 On the Computer Control and Reticle dimmer assembly, press and hold MARK X pushbutton.

6.3.11.18 On the DSKY observe

VERB 15 NOUN 50
Row 1 = 00112
Prog Alarm lamp is lighted
Press ERR RSET

6.3.11.19 Enter the following on K-148

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.20 Observe that DSKY Row 1 displays 00004.

6.3.11.21 Release MARK X pushbutton

6.3.11.22 Observe that DSKY Row 1 displays 00000.

6.3.11.23 Press and hold the MARK Y pushbutton on the Computer Control and Reticle Dimmer Assembly.

6.3.11.23.1 On the DSKY observe:

VERB 15 NOUN 50
Row 1 = 00112
Program Alarm lamp is lighted
Press ERR Reset

6.3.11.23.2 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.24 Observe that DSKY Row 1 displays 00010.

6.3.11.25 Release MARK Y pushbutton.

6.3.11.26 Observe that DSKY Row 1 displays 00000.

6.3.11.27 Press and hold the REJECT pushbutton on the Computer Control and Reticle Dimmer Assembly.

6.3.11.28 Observe that DSKY Row 1 displays 00020.

6.3.11.29 Release the REJECT pushbutton.

6.3.11.30 Observe that DSKY Row 1 displays 00000.

[illegible]

6.3.11.31 On the DSKY perform the following operation:

VERB 36 ENTR

6.3.11.32 On the Computer Control and Reticle dimmer assembly, rotate the RETICLE BRIGHTNESS control to its minimum light intensity position. View through the AOT and verify that the reticle lamp is off.

6.3.11.33 While viewing through the AOT, slowly rotate the RETICLE BRIGHTNESS control to increase the reticle brightness until a stop is reached. Observe that the reticle brightness has increased in intensity. Return RETICLE BRIGHTNESS control to off state.

6.3.11.34 AOT eyepiece Heater Test.

6.3.11.34.1 Secure milliameter HP 428B and current probe HP428A-21A.

6.3.11.34.2 Locate P1 at Computer Control and Reticle Dimmer assembly. Push lacing cord away from P1 back to fifth tie point.

6.3.11.34.3 Clip current probe HP428A-21A to blue wire in cable with red arrow pointing away from P1. Measure and record current indication. The current shall be between 139 and 244 ma.

6.3.11.34.4 Remove current probe, push lacing cord back to P1 and spot tie.

6.3.12 Gimbal Friction Test

6.3.12.1 Inner Gimbal Friction Test

6.3.12.1.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 3 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.1.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00200).

6.3.12.1.3 Set up Analog Recorder to monitor the following signals:

MEAS. NO.	SIGNAL NAME
a. GG 2110	IG Torque Motor Current
b. GG 2106	IG Servo Error Total
c. GG 2107	IG Servo Error In Phase
d. GG 2112	IG 1x Resolver Sine
e. GG 2113	IG 1x Resolver Cosine
f. GG 2220	IG CDU Fine Error
g. GG 1201	IMU 28V 1% 800 CPS

6.3.12.1.4 Set up Analog Recorder to monitor the following signals:

MEAS. NO.	SIGNAL NAME
a. GG 2300	PIPA TEMP
b. GG 2301	IRIG TEMP
c. GG 1520	+28 VDC LGC OPR BUS

6.3.12.1.5 After 10 seconds has elapsed since step 6.3.12.1.1, enter the following into K-148:

```
VERB 21  NOUN 01  ENTR
00403    ENTR
00000    ENTR
```

6.3.12.1.6 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 = 00000
R3 = 00403

6.3.12.1.7 On K-148 enter the following sequence:

```
NOUN 15  ENTR
00000    ENTR  ENTR (Push ENTR pushbutton twice)
Verify R1 = +00000
37777    ENTR  ENTR
Verify R1 = 37777
37743    ENTR  ENTR
Verify R1 = 37743
00000    ENTR  ENTR
Verify R1 = 00000
00000    ENTR  (once)
Verify R1 = 00000
```

6.2.12.1.8 Start analog recorders using a chart speed of 10 mm/sec (IG-360° TORQUE)

6.3.12.1.9 On K-148 enter the following sequence:

```
VERB 01  NOUN 01  ENTR
00366             ENTR
Records contents of Row 1 XXXXY
VERB 21  NOUN 01  ENTR
00366             ENTR
XXXXY'            ENTR
Where Y' is obtained from Table II.
VERB 42           ENTR
VERB 33           ENTR
```

6.3.12.1.10 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.1.11 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 3 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.1.12 On the CRT, verify CDU X, CDU Y, CDU Z all indicate +00000 (±00200).

6.3.12.1.13 After 10 seconds has elapsed since step 6.3.12.1.11 enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
00403 ENTR
00000 ENTR

6.3.12.1.14 Verify on CRT, DSKY display.

VERB 21	NOUN 01
R1	00000
R3	00403

6.3.12.1.15 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR (Press ENTR pushbutton twice)
Verify R1 = 00000
40000 ENTR ENTR
Verify R1 = 40000

6.3.12.1.15 (cont)

40034 ENTR ENTR
Verify R1 = 40034
00000 ENTR ENTR
Verify R1 = 00000
00000 ENTR (once)
Verify R1 = 00000

6.3.12.1.16 Start analog recorders using a chart speed of 10 mm/sec (IG +360° TORQUE)

6.3.12.1.17 On K-148 enter the following sequence

VERB 42 ENTR
VERB 33 ENTR

6.3.12.1.18 Monitor analog recorder. When the IG Torque Motor Current signal (OG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.2 Outer Gimbal Friction Test

6.3.12.2.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 3 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.2.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00200).

6.3.12.2.3 Set up analog recorder to monitor the following:

MEAS NO.	SIGNAL NAME
a. OG 2167	OG Servo Error In Phase
b. OG 2170	OG Torque Motor Current
c. OG 2166	OG Servo Error Total
d. OG 2280	OG CDU Fine Error
e. OG 2172	OG 1X Resolver Sine
f. OG 2173	OG 1X Resolver Cosine

6.3.12.2.4 After 10 seconds has elapsed since step 6.3.12.2.1 enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
00403 ENTR
37777 ENTR

6.3.12.2.5 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 37777
R3 00403

6.3.12.2.6 On K-148 enter the following sequence:

NOUN 15 ENTR
37743 ENTR ENTR (Press ENTR pushbutton twice)
Verify R1 = 37743
00000 ENTR ENTR
Verify R1 = 00000
00000 ENTR ENTR
Verify R1 = 00000
00000 ENTR ENTR
Verify R1 = 00000
00000 ENTR (once)
Verify R1 = 00000

6.3.12.2.7 Start analog recorders using a chart speed of 10 mm/sec. (OG - 360° TORQUE)

6.3.12.2.8 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.2.9 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.2.10 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 3 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.2.11 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00200).

6.3.12.2.12 After 10 seconds has elapsed since step 6.3.12.2.10, enter the following sequence into K-148.

VERB 21 NOUN 01 ENTR
00403 ENTR
40000 ENTR

6.3.12.2.13 Verify on CRT, DSKY display.

VERB 21 NOUN 01
R1 40000
R3 00403

6.3.12.2.14 On K-148 enter the following sequence:

```
NOUN 15  ENTR
40034    ENTR    ENTR
Verify R1 = 40034
00000   ENTR   ENTR
Verify R1 = 00000
00000   ENTR   ENTR
Verify R1 = 00000
00000   ENTR   ENTR
Verify R1 = 00000
00000   ENTR     (once)
Verify R1 = 00000
```

6.3.12.2.15 Start analog recorders using a chart speed of 10 mm/sec (OG +360° TORQUE)

6.3.12.2.16 On K-148 enter the following sequence

```
VERB 42  ENTR
VERB 33  ENTR
```

6.3.12.2.17 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.3 Middle Gimbal Friction Test

6.3.12.3.1 On K-148 enter the following sequence:

```
VERB 40  NOUN 20  ENTR  Wait 3 seconds
VERB 41  NOUN 20  ENTR
+00000   ENTR
+00000   ENTR
+06750   ENTR
```

6.3.12.3.2 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00200, and CDU Z = +06750±00200.

6.3.12.3.3 Set up analog recorder to monitor the following:

MEAS. NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2137	MG Servo Error In Phase
c. GG 2150	MG Torque Motor Current
d. GG 2143	MG 1X Resolver Cosine
e. GG 2250	MG CDU Fine Error
f. GG 2142	MG 1X Resolver Sine

6.3.12.3.4 After 10 seconds have elapsed since step 6.3.12.3.1, enter the following sequence into K-148:

```
VERB 21  NOUN 01  ENTR
00403    ENTR
00000    ENTR
```

6.3.12.3.5 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 = 00000
R3 = 00403

6.3.12.3.6 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR (Press ENTR pushbutton twice)
Verify R1 = 00000
00000 ENTR ENTR
Verify R1 = 00000
00000 ENTR ENTR
Verify R1 = 00000
14000 ENTR ENTR
Verify R1 = 14000
00000 ENTR (Once)
Verify R1 = 00000

6.3.12.3.7 Start analog recorders using a chart speed of 10 mm/sec. (MG - 135° TORQUE)

6.3.12.3.8 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.3.9 Monitor analog recorder. When MG Torque Motor Current (GG 2140) drops to a quiescent level (approximately 6 minutes), stop the recorders.

6.3.12.3.10 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 3 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
-06750 ENTR

6.3.12.3.11 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00200, and CDU Z = -06750±00200.

6.3.12.3.12 After 10 seconds has elapsed since step 6.3.12.3.10, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
00403 ENTR
00000 ENTR

6.3.12.3.13 On the CRT, DSKY display verify:

VERB 21 NOUN 01
R1 = 00000
R3 = 00403

6.3.12.3.14 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR (Press ENTR pushbutton twice)
Verify R1 = 00000
00000 ENTR ENTR
Verify R1 = 00000
00000 ENTR ENTR
Verify R1 = 00000
63777 ENTR ENTR
Verify R1 = 63777
77777 ENTR (once)
Verify R1 = 77777

6.3.12.3.15 Start analog recorders using a chart speed of 10 mm/sec. (MG +135° TORQUE)

6.3.12.3.16 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.3.17 Monitor analog recorder. When the MG Torque Motor Current signal (GG 2140) drops to a quiescent level (approximately 6 minutes) stop the recorders.

6.3.12.3.18 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 36 ENTR

6.3.12.4 **Test Analysis**

6.3.12.4.1 Remove the strip charts from analog recorders.

6.3.12.4.2 Examine each trace carefully to detect any sharp discontinuities of the traces. Disregard all transients less than 0.5 second (5 mm) on any Torque Motor Current signal. Disregard all transients less than 0.2 second (2 mm) on any CDU Fine Error signal.

6.3.12.4.3 No Torque Motor Current signal on (GG 2140, GG 2170, GG 2110) shall ~~ever exceed (0.125) amp. Sensitivity on recorder~~ is 20 ma/division. for GG 2110, GG 2140 and 36 ma/division for GG 2170.

6.3.12.4.4 No CDU Fine Error on (GG 2220, GG 2280, GG 2250) shall ever exceed (.070) volts. Sensitivity on recorder is 30 mv/division.

6.3.13 **Stabilization Loop Step Response Test**

6.3.13.1 **IG Response Test**

6.3.13.1.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 3 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.13.1.2 On CRT, verify IG MG, and OG gimbal angles are between 358 and 002.

6.3.13.1.3 Set up analog recorder to monitor the following:

MEAS. NO.	SIGNAL NAME
a. GG 2110	IG Torque Motor Current
b. GG 2106	IG Servo Error Total
c. GG 2107	IG Servo Error In Phase
d. GG 2112	IG 1X Resolver Sine
e. GG 2113	IG 1X Resolver Cosine
f. GG 2220	IG CDU Fine Error
g. GG 1201	IMU 28V 1 PCT 800 CPS

6.3.13.1.4 On K-148 initiate FINE ALIGN by entering the following sequence:

VERB 42 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.13.1.5 On the CRT verify CDU X, CDUY Y and CDU Z indicate +00000±00200.

CAUTION: If the transients caused by the subsequent step input do not damp out within 15 seconds, remove IMU Operate Power.

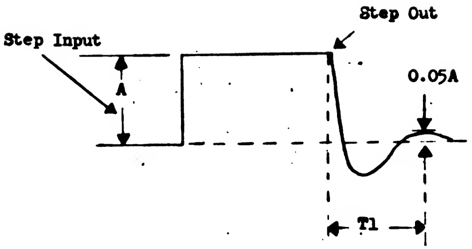
6.3.13.1.6 Enter 1000 into R-START 155.

6.3.13.1.7 Press XEQ/SEAL pushbutton on R-155 to enter the DC step voltage into the IG stabilization loop.

6.3.13.1.8 Prepare to start analog recorder at a chart speed of 100 mm/sec. (IG RESPONSE TEST).

6.3.13.1.9 Enter 0000 into R-START 155. Start analog recorder. Press the XEQ/SEAL pushbutton to remove the step input to the IG stabilization loop.

6.3.13.1.10 After the transient on the recorder has died out, stop the recorder.



TYPICAL STAB LOOP RESPONSE TO STEP INPUT

FIGURE 3

6.3.13.1.11 From the Servo Error In Phase signal recorder trace measure the time interval (T1, Fig. 3) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 3). The period T1, shall not exceed 0.1 second and the trace shall have no more than 3 overshoots.

6.3.13.2 MG Response Test

6.3.13.2.1 Set up analog recorder to monitor the following:

MEAS NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2137	MG Servo Error In Phase
c. GG 2140	MG Torque Motor Current
d. GG 2143	MG 1X Resolver Cosine
e. GG 2250	MG CDU Fine Error
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1Ø 800 cps

6.3.13.2.2 On the CRT, verify CDU X , CDU Y and CDU Z indicate +00000 (±00200).

CAUTION: If the transients caused by the subsequent step input do not die out within 15 seconds, remove IMU Operate Power.

6.3.13.2.3 Enter 0100 into R-START 155. Press XEQ/SEAL pushbutton R-155 to enter the DC step voltage into the MG stabilization loop.

6.3.13.2.4 Prepare to start analog recorder at a chart speed of 100 mm/sec. (MG RESPONSE TEST).

6.3.13.2.5 Enter 0000 into R-START 155. Start analog recorder. Press XEQ/SEAL pushbutton to remove the step input to the MG stabilization loop.

6.3.13.2.6 After the transient on the recorder has died out, stop the recorder.

6.3.13.2.7 From the Servo Error In Phase signal recorder trace measure the time interval (T1 Fig. 3) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig 3). The period, T1, shall not exceed 0.1 seconds and the trace shall have no more than 3 overshoots.

6.3.13.3 OG Response Test

6.3.13.3.1 Set up analog recorder to monitor the following:

MEAS NO.	SIGNAL NAME
a. GG 2167	OG Servo Error In Phase
b. GG 2170	OG Torque Motor Current
c. GG 2166	OG Servo Error Total
d. GG 2280	OG CDU Fine Error
e. GG 2172	OG 1X Resolver Sine
f. GG 2173	OG 1X Resolver Cosine
g. GG 1201	IMU 28V 1Ø 800 cps

6.3.13.3.2 On the CRT, verify CDU X, CDU Y and CDU Z indicate +00000(±00200).

CAUTION: If the transients caused by the subsequent step input do not die out within 15 seconds, remove IMU operate power.

6.3.13.3.3 Enter 0010 into R-START 155. Press XEQ/SEAL pushbutton on R-155 to enter the DC step voltage into the OG stabilization loop.

6.3.13.3.4 Prepare to start analog recorder at a chart speed of 100 mm/sec. (OG RESPONSE TEST).

6.3.13.3.5 Enter 0000 into R-155. Start analog recorder. Press XEQ/SEAL pushbutton to remove the step input to the OG stabilization loop.

6.3.13.3.6 After the transient on the recorder has died out, stop the recorder.

6.3.13.3.7 From the Servo Error In Phase signal recorder trace, measure the time interval (T1, Fig 3) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 3). The period, T1, shall not exceed 0.1 second and the trace shall have not more than 3 overshoots.

6.3.13.3.8 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.14 G&N Fine Alignment Test

NOTE: The Fine Alignment test results are PIPA bias corrected. It is possible for a considerable time lag to occur between PIPA bias calculations in section 6.3.9 of this specification and performance of the Fine Alignment test. The applicable portions of section 6.3.9 should be performed and the PIPA bias terms recalculated if it is deemed necessary for the proper evaluation of the Fine Alignment Test results.

6.3.14.1 On K-148 enter:

```
VERB 01  NOUN 10  ENTR
00003             ENTR
```

6.3.14.2 Record CRT, DSKY Row 1 display as AAAAA and the time of day.

6.3.14.3 On K-148 enter:

```
VERB 21  NOUN 01  ENTR
03377             ENTR
AAAAA             ENTR
VERB 06  NOUN 02  ENTR
03377    ENTR
```

6.3.14.4 Record CRT DSKY Row 1, display as ±BBBBB.

6.3.14.5 Perform the following calculations:

a. $\frac{\text{BBBBBX } 5.12}{3600} = \text{CCCC.C}$ Contents of high order scalar register in hours.

b. Calculate the times of day at which the contents of the high order scalar will be at the following times.

2.91
5.82
8.73
11.64
14.55
17.46
20.37
23.30

6.3.14.6 If the time of day is within 12 minutes of any of those times calculated in 6.3.14.5.b when about to complete step 6.3.14.30 wait until that time has passed and then proceed.

6.3.14.7 On K-148 enter:

VERB 01 NOUN 01 ENTR
00366 ENTR
Record contents of Row 1 XXXXY
VERB 21 NOUN 01 ENTR
00366 ENTR
XXXXY' ENTR
Where Y' is obtained from Table II.
VERB 57 ENTR
00003 ENTR

6.3.14.8 Verify CRT DSKY display as:

VERB 06 NOUN 61 (Flashing)
R1 = +13500 (SM Azimuth)
R2 = 28.156 (Site Latitude)

NOTE: If R1 and R2 indications are correct proceed to step 6.3.14.10.

6.3.14.9 On K-148 enter:

VERB 21 ENTR
+13500 ENTR
VERB 22 ENTR
+28516 ENTR

6.3.14.10 On K-148 enter:

VERB 33 ENTR
Observe on CRT DSKY display
VERB 21 NOUN 30 (Flashing)

6.3.14.11 On K-148 enter:

0000X ENTR (Test position, either 1 or 2)
00000 ENTR (Use AOT)
Observe on CRT DSKY display:
VERB 06 NOUN 61 (Flashing)
Disregard Row 1, 2, and 3 indications

6.3.14.12 On K-148 enter:

VERB 21	ENTR
+XXX.XX	ENTR (L tgt. true azimuth from 6.3.15.1.14)
VERB 22	ENTR
+XXX.XX	ENTR (L tgt. elevation from 6.3.15.1.3)
VERB 23	ENTR
00001	ENTR (L tgt. number)
VERB 33	ENTR

Observe on CRT DSKY display:
VERB 06 NOUN 61 (Flashing)

Disregard Row 1, 2, and 3 indications.

6.3.14.13 On K-148 enter:

VERB 21	ENTR
+XXX.XX	ENTR (F tgt. true azimuth from 6.3.15.1.14)
VERB 22	ENTR
+XXX.XX	ENTR (F tgt. elevation from 6.3.15.1.12)
VERB 23	ENTR
00002	ENTR (F tgt. number)
VERB 33	ENTR

Observe on CRT DSKY display

VERB 51 (flashing)
R1 = 00001

6.3.14.14 On Computer Control and Reticle Dimmer Assembly, press MARK X pushbutton. Observe on DSKY display:

VERB 21 NOUN 30 (Flashing)

6.3.14.15 On DSKY press ENTR.

Observe on DSKY display:

VERB 21 NOUN 43 (Flashing)

6.3.14.16 On DSKY enter:

00001 ENTR (L Detent Code)
Observe on DSKY display
VERB 21 NOUN 42 (Flashing)

6.3.14.17 Set AOT to "L" position.

6.3.14.18 Rotate AOT control knob until the center of the L tgt. reticle is super imposed between the double Y reticle. Record AOT counter value as LY XXX.XX.

6.3.14.19 Rotate AOT control knob until the center of the L tgt. reticle is superimposed between the double lines of the SPIRAL reticle. Record AOT counter value as LS XXX.XX.

6.3.14.20 On DSKY enter:

±XXX.XX ENTR (value of LY)
Observe on DSKY display:
VERB 22 NOUN 42 (Flashing)

6.3.14.21 On DSKY enter:

±XXX.XX ENTR (Value of LS)
Observe on DSKY display:
VERB 51 (Flashing)
R1 = 00002

6.3.14.22 On Computer Control and Reticle Dimmer Assembly, press MARK X pushbutton. Observe on DSKY display:

VERB 21 NOUN 30 (Flashing)

6.3.14.23 On DSKY press ENTR. Observe on DSKY display:

VERB 21 NOUN 43 (Flashing)

6.3.14.24 On DSKY enter:

00002 ENTR (F Detent Code)

Observe on DSKY display:
VERB 21 NOUN 42 (Flashing)

6.3.14.25 Set AOT to "F" position.

6.3.14.26 Rotate AOT control knob until the center of the F tgt. reticle is superimposed between the double Y reticle. Record AOT counter value as FY XXX.XX.

6.3.14.27 Rotate AOT control knob until the center of the F tgt. reticle is superimposed between the double lines of the SPIRAL reticle. Record AOT counter value as FS XXX.XX.

6.3.14.28 On DSKY enter:

±XXX.XX ENTR (value of FY)
Observe on DSKY display:
VERB 22 NOUN 42 (Flashing)

6.3.14.29 On DSKY enter:

±XXX.XX ENTR (value of FS)

NOTE: Wait until DSKY display indicates VERB 51 (Flashing) R1 = 00001 before proceeding.

NOTE: Before completing step 6.3.14.30 check time of day to verify that the high order scalar will not overflow within the next 12 minutes.

6.3.14.30 Repeat steps 6.3.14.14 through 6.3.14.29.

6.3.14.31 In approximately 7 minutes, observe on CRT DSKY display and record.

VERB 06 NOUN 66 (Flashing)
R1 = XXXXX (Whole number part of Y_{sm} misalignment about Z_{sm})
R2 = .XXXXX (Fractional number part of Y_{sm} misalignment about Z_{sm}.)

6.3.14.32 On K-148 enter.

VERB 33 ENTR
Observe on CRT DSKY display and record:
VERB 06 NOUN 66 (Flashing)

R1 = XXXXX (Whole number part of Z_{sm} misalignment about Y_{sm})
R2 = .XXXXX (Fractional number part of Z_{sm} misalignment about Y_{sm})

6.3.14.33 On K-148 enter:

VERB 36 ENTR
Press ERROR RESET

6.3.14.34 Repeat steps 6.3.14.7 through 6.3.14.30.

6.3.14.35 In approximately 7 minutes, observe on CRT DSKY display and record.

VERB 06 NOUN 66 (Flashing)
R1 = XXXXX (Whole number part of Xsm misalignment about Ysm)
R2 = .XXXXX (Fractional number part of Xsm misalignment about Ysm)

6.3.14.36 On K-148 enter:

VERB 33 ENTR
Observe on CRT DSKY display and record:
VERB 06 NOUN 66 (Flashing)
R1 = XXXXX (Whole number part of Ysm misalignment about Xsm)
R2 = .XXXXX (Fractional number part of Ysm misalignment about Xsm)

6.3.14.37 On K-148 enter:

VERB 36 ENTR
Press ERROR RESET
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.14.38 Results. The PIPA bias determined previously in the IMU Performance Test (6.3.9) must be subtracted from the resultant data of the test.

6.3.14.38.1 Y PIPA misalignment

	R1	R2
About Z axis (from 6.3.14.31) =	±XXXXX.	XXXXX sec
Less Y PIPA bis (from 6.3.9) =	-(±XXXXX.	XXXXX) sec
Y PIPA misalingment about Z axis =	----- .	----- sec

This value shall not exceed 600 $\overset{\frown}{\text{sec}}$

6.3.14.38.2 Z PIPA misalingment

	R1	R2
About Y axis (from 6.3.14.32) =	±XXXXX.	XXXXX sec
Less Z PIPA bias (from 6.3.9) =	-(±XXXXX.	XXXXX) sec
Z PIPA misalignment about Y axis =	±----- .	----- sec

This value shall not exceed 600 $\overset{\frown}{\text{sec}}$

6.3.14.38.3 Z PIPA misalignment

	R1	R2
About Y axis (from 6.3.14.35) =	±XXXXX.	XXXXX sec
Less X PIPA bias from (6.3.9) =	-(±XXXXX.	XXXXX) sec
X PIPA misalignment about Y axis =	± ----- .	----- sec

This value shall not exceed 600 $\overset{\frown}{\text{sec}}$

6.3.14.38.4 Y PIPA misalignment

	R1	R2
About X axis from (6.3.14.36) =	±XXXXX.	XXXXX sec
Less Y PIPA bias (from 6.3.9) =	-(±XXXXX.	XXXXX) sec
Y PIPA misalignment about X axis =	±----- .	----- sec

This value shall not exceed 600 $\overset{\frown}{\text{sec}}$

6.3.15 **AOT Functional Accuracy Test**

NOTE: Use of a Dioptometer is required when sighting through AOT.

6.3.15.1 Determination of Detent Angle Reference.

NOTE: The included angles between targets LOS shall be known to ±10 arc seconds. The elevation of each target LOS shall be known to ±15 arc seconds.

6.3.15.1.1 Place AOT in L detent position.

NOTE: Communication between AOT and target theodolite operators is required.

6.3.15.1.2 While viewing through AOT, instruct the target L operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target L, until the target reticle appears in the lower right quadrant of the AOT field of view.

NOTE: The target theodolite base must be level when alignment is achieved.

6.3.15.1.3 Upon alignment, zero the azimuth dial and record the elevation indication of target L as ϕ_1.

6.3.15.1.4 Place AOT in R detent position.

6.3.15.1.5 While viewing through AOT, instruct the target R operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target R, until the target reticle appears in the lower left quadrant of the AOT field of view.

6.3.15.1.6 Rotate the AOT control knob clockwise until the center of the target reticle is superimposed between the double Y reticle. Read and record the target R elevation dial indication, as ϕ_3. Zero the target R azimuth dial. Record AOT dial indication as RY = XXX.XX.

6.3.15.1.7 Rotate the AOT control knob until the center of the target reticle is superimposed between the double SPIRAL lines of AOT reticle. Record AOT dial indication as RS = XXX.XX.

6.3.15.1.8 Collimate L and R targets on each other, record each target azimuth with each target LOS leveled.

Target L az = α_1, Target R as = α_3

6.3.15.1.9 Place the AOT in F detent position.

6.3.15.1.10 Move the R target theodolite to a position in front of the AOT F detent position. (The target shall now be referred to as the F target).

6.3.15.1.11 While viewing through the AOT, instruct the target F operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target reticle appears in the center of the AOT reticle.

6.3.15.1.12 Upon alignment, zero the azimuth dial and record the elevation indication of target F as ϕ_2.

6.3.15.1.13 Collimate L and F targets on each other, record each target azimuth with each target LOS leveled. Target F az = α_2.

6.3.15.1.14 Determine the true azimuth of targets L and F with respect to the AOT. The target azimuth shall be known to within 0.5 arc degrees.

6.3.15.1.15 Rotate the F target in azimuth and elevation to the specified and recorded angles of 6.3.15.1.12.

6.3.15.1.16 Rotate the L target in azimuth and elevation to the specified and recorded angles of 6.3.15.1.13.

6.3.15.1.17 Calculate the values of the included angles between target L and F as X_1 and targets L and R as X_2.

$$X_1 = \cos^{-1}\left\{\sin\phi_1 \sin\phi_2 + \cos\phi_1 \cos\phi_2 \cos\left[180-(\alpha_1+\alpha_2)\right]\right\}$$

$$X_2 = \cos^{-1}\left\{\sin\phi_1 \sin\phi_3 + \cos\phi_1 \cos\phi_3 \cos\left[180-(\alpha_3+\alpha_1)\right]\right\}$$

Where: α_1 = az value, step 6.3.15.1.8

α_2 = az value, step 6.3.15.1.13

α_3 = az value, step 6.3.15.1.8

6.3.15.2 Computer Loading of Detent Calibration Data

6.3.15.2.1 On K-148 enter:

VERB 21	NOUN 03	ENTR	
01467		ENTR	
XXX.XX		ENTR	(Detent L Az data)
		ENTR	
01470		ENTR	
XXX.XX		ENTR	(Detent F AZ data)
		ENTR	
01471		ENTR	
XXX.XX		ENTR	(Detent R AZ data)
		ENTR	
01472		ENTR	
XXX.XX		ENTR	(Detent L EL data)
		ENTR	
01473		ENTR	
XXX.XX		ENTR	(Detent F EL data)
		ENTR	

6.3.15.2.1 (cont)

1474 ENTR
XXX.XX ENTR (Detent R EL data)

6.3.15.3 AOT Measurement of X_1

6.3.15.3.1 On K-148 enter:

VERB 57 ENTR
00012 ENTR
Observe VERB 51 flashing and R1 = 00001 on CRT DSKY display.

6.3.15.3.2 On Computer Control and Reticle Dimming Assembly press MARK X pushbutton. Observe VERB 50 displayed on CRT DSKY display.

6.3.15.3.3 On DSKY press ENTR

Observe VERB 21 NOUN 30 flashing on DSKY

6.3.15.3.4 On DSKY enter:

00000 ENTR
Observe VERB 21 NOUN 43 flashing
00001 ENTR
Observe VERB 21 NOUN 42 flashing

6.3.15.3.5 Set AOT in L detent position.

6.3.15.3.6 Rotate the AOT control knob clockwise until the center of the target reticle is superimposed between the double Y reticle. Read and record LY = XXX.XX.

6.3.15.3.7 Rotate the AOT control knob until the center of the target reticle is superimposed between the double SPIRAL lines of AOT reticle. Record AOT Dial indication as LS XXX.XX.

6.3.15.3.8 On DSKY enter:

±XXX.XX ENTR (LY from 6.3.15.3.6)
Observe VERB 22 NOUN 42 flashing
±XXX.XX ENTR (LS from 6.3.15.3.7)
Observe VERB 51 flashing and R1 = 00002.

6.3.15.3.9 On Computer Control and Reticle Dimming Assembly, press MARK X pushbutton. Observe VERB 50 displayed.

6.3.15.3.10 On DSKY press ENTR
Observe VERB 21, NOUN 30 flashing on DSKY.

6.3.15.3.11 On DSKY enter:

00000 ENTR
Observe VERB 21, NOUN 43 flashing
00002 ENTR
Observe VERB 21, NOUN 42 flashing

6.3.15.3.12 Set AOT in F detent position.

6.3.15.3.13 Rotate AOT control knob clockwise until the center of the target reticle is superimposed between the double Y reticle. Record AOT dial indication as FY = XXX.XX.

6.3.15.3.14 Rotate the AOT control knob until the center of the target reticle is superimposed between the double S reticle lines. Record AOT dial indications as FS = XXX.XX.

6.3.15.3.15 On DSKY enter:

±XXX.XX ENTR (FY from 6.3.15.3.13)
Observe VERB 22 NOUN 42 flashing
±XXX.XX ENTR (FS from 6.3.15.3.14)
Observe VERB 06 NOUN 03, R1 = X1±0.08 degrees.

6.3.15.4 AOT Measurement of X2

6.3.15.4.1 On K-148 enter

VERB 57 ENTR
00012 ENTR
Observe VERB 51 flashing and R1 = 00001 on CRT DSKY display.

6.3.15.4.2 On Computer Control and Reticle Dimming Assembly, press MARK X pushbutton. Observe VERB 50 displayed on CRT DSKY display.

6.3.15.4.3 On DSKY press ENTR. Observe VERB 21 NOUN 30 flashing on DSKY.

6.3.15.4.4 On DSKY enter:

00000 ENTR
Observe VERB 21 NOUN 43 flashing
00001 ENTR
Observe VERB 21 NOUN 42 flashing
±XXX.XX ENTR (LY from 6.3.15.3.6)
Observe VERB 22 NOUN 42 flashing
±XXX.XX ENTR (LS from 6.3.15.3.7)
Observe VERB 51 flashing and R1 = 00002.

6.3.15.4.5 On Computer Control and Reticle Dimming Assembly, press MARK X pushbutton. Observe VERB 50 displayed.

6.3.15.4.6 On DSKY press ENTR. Observe VERB 21, NOUN 30 flashing on DSKY.

6.3.15.4.7 On DSKY enter:

00000 ENTR
Observe VERB 21 NOUN 43 flashing
00002 ENTR
Observe VERB 21 NOUN 42 flashing
±XXX.XX ENTR (RY from 6.3.15.1.6)
Observe VERB 22 NOUN 42 flashing
±XXX.XX ENTR (RS from 6.3.15.1.7)
Observe VERB 06 NOUN 03, R1 = X2±0.08 degrees.

6.3.16 **Flight Rope Fixed Memory Bank Sum Check**

NOTE: Before proceeding with this test, obtain a Computer Program listing of the flight program being tested. Prepare a list of the bank CKSM bugger words.

6.3.16.1 Verify G&N system in Standby Mode.

6.3.16.2 On K-148 enter the following sequence:

Press ERR RST
VERB 56 ENTR
Observe VERB 05 NOUN 01 flashing

6.3.16.3 Record the CRT DSKY display indications.

Row 1 = AAAAA Bank Sum
Row 2 = 000BB Bank Number
Row 3 = CCCCC (Bank CKSM bugger word)

Row 1 shall be the same as or the complement of the number displayed in Row 2. Row 3 indication shall be the same as the bugger word recorded above for the bank tested.

6.3.16.4 On K-148 enter VERB 33 ENTR

6.3.16.5 Repeat paragraphs 6.3.16.3 and 6.3.16.4 until all memory bank sums have been checked.

6.3.16.6 On K-148 enter VERB 34 ENTR.

6.3.17 LGC Clock Alignment Test

6.3.17.1 Verify the following CRT indications:

ACCEPT UPLINK - ON
UP LOCK - OFF
OP ERROR - OFF

6.3.17.2 Set R144 to 00001 and execute observe that CRT indicates TIME ERROR as blank.

6.3.17.3 Set 70 00024 020 into C156 to insert K-FACT Execute.

6.3.17.4 Set 71 00000 000 into C156 to insert TEPOCH. Execute.

6.3.17.5 Obtain Range Time in Hours, Minutes, and Seconds.

6.3.17.6 Add 5 minutes to Range time and insert 90 XX (HRS) XX (MIN's) XXX (SEC's) into C156. Execute

6.3.17.7 Set 91 + 00000 00 into C156 to insert AGC RESET time. Execute.

6.3.17.8 Before Range Time +5 minutes occurs, set 0001 into R152. Execute.

6.3.17.9 Verify that CRT indication of TIME ERROR is blank.

NOTE: If TIME ERROR 1 is present, repeat all preceding steps of LGC Clock Alignment.

6.3.17.10 Set R152 to 0000. Execute.

6.3.17.11 Set R152 to 0010. Execute. Record CRT indication of DELTA TIME. Verify that CRT indication of TIME ERROR is blank.

6.3.17.12 Set R152 to 0000. Execute.

6.3.17.13 Set R152 to 0100. Execute.. Verify that CRT indication of TIME ERROR is blank.

6.3.17.14 Set R152 to 0000. Execute.

6.3.17.15 Set R152 to 0010. Execute. Record CRT indication of DELTA TIME. DELTA TIME shall be 00(HRS), 00(MIN's) 000.000(SEC's) ±0.01 SEC.

6.3.17.16 Set R152 to 0000. Execute.

APPENDIX I

MEASUREMENT TOLERANCES

SIGNAL	SIGNAL NAME	G&N LAB TEST REQUIREMENT	PSAAM AND/OR SCA UNCERTAINTY % OF FULL SCALE
OG 1020 link 4**	+14 vdc LGC Supply	14.0±0.4 vdc	0%
OG 1030 link 4	+4 vdc LGC Supply	4.0±0.2 vdc	0%
OG 1040 link 5**	+120 vdc PIPA Supply	120±6.0 vdc	1%
OG 1070 link 4	+4 vdc CDU Supply	4.0±0.2 vdc	0%
OG 1100 link 4	-28 vdc Supply	-27.5±6.0 vdc	0%
OG 1110 link 5	2.5 vdc Telemetry Bias No. 1	2.5±0.1 vdc	0%
OG 1201 link 5	IMU 28V 800 cps 1%	28±0.56V rms	1%
OG 1202 link 4	IMU 28V 800 cps 5%	28±1.4V rms	1.5%
OG 1203 link 4	IMU 28V 800 cps 5%	28±2.1V rms	1.5%
OG 1331 link 5	3.2 kc 28V Supply 1%	28.6±0.56V rms	1%
OG 1500 link 4	+28 vdc IMU Oper BUS	28.0-3.5, +5.5 vdc	0%
OG 1510 link 4	+28 vdc IMU STBY BUS	28.0 -3.5, +5.5 vdc	0%
OG 1513X link 5	+28 vdc IMU STBY/OFF	28.0±1 vdc	0%
OG 1520 link 4	+28 vdc LGC Oper BUS	28.0 + 4.5, -3.5 vdc	0%
OG 1523X link 5	+28 vdc LGC Operate	28.0±1 vdc	0%
OG 2001 link 5	X PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
OG 2021 link 5	Y PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
OG 2041 link 5	Z PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
OG 2106 link 4	IG Servo Error Total	0.0±60 MV rms at null	1%
OG 2107 link 5	IG Servo Error IN PH	0.0±60 MV rms at null	2%
OG 2110 link 4	IG Torque Motor Current	0.5 AMP Max during any fine Align Torque	0%
OG 2110 link 5	IG Torque Motor Current	0.5 AMP Max during any fine Align Torque	1%
OG 2112 link 5	IG 1X Resolver Out-Sine	19.65±0.98V rms at 45°	2.5%
OG 2113 link 5	IG 1X Resolver Out-Cosine	19.65±0.98V rms at 45°	2.5%
OG 2121 link 5	IG 1X Resolver Out-Sine 11°	5.35±0.27V rms at 11°	2%
OG 2136 link 4	MG Servo Error Total	0.0±60 MV rms at null	1%
OG 2137 link 5	MG Servo Error IN PH	0.0±60 MV rms at null	2%
OG 2140 link 4	MG Torque Motor Current	0.5 AMP Max during any fine Align Torque	0%
OG 2140 link 5	MG Torque Motor Current	0.5 AMP Max during any fine Align Torque	1%
OG 2142 link 5	MG 1X Resolver Out-Sine	19.65±0.98V rms at 45°	2.5%
OG 2143 link 5	MG 1X Resolver Out-Cosine	19.65±0.98V rms at 45°	2.5%
OG 2151 link 5	MG 1X Resolver Out-Sine 11°	5.35±0.27V rms at 11°	2%
OG 2166 link 4	OG Servo Error Total	0.0±60 MV rms at null	1%
OG 2167 link 5	OG Servo Error IN PH	0.0±60 MV rms at null	2%
OG 2170 link 4	OG Torque Motor Current	0.9 AMP Max during any fine Align Torque	0%
OG 2170 link 5	OG Torque Motor Current	0.9 AMP Max during any fine Align Torque	1%
OG 2172 link 5	OG 1X Resolver Out-Sine	19.65±0.98V rms at 45°	2.5%
OG 2173 link 5	OG 1X Resolver Out-Cosine	19.65±0.98V rms at 45°	2.5%
OG 2181 link 5	OG 1X Resolver Out-Sine 11°	5.35±0.27V rms at 11°	2%
OG 2219 link 5	Pitch Attitude Error	5.05±0.5V rms at 17°	1%
OG 2220 link 4	IG CDU Fine Error	0.0±0.07V rms at null	1%
OG 2221 link 4	IG CDU Coarse Error	0.0±0.68V rms at null	1%

APPENDIX I (Continued)

SIGNAL	SIGNAL NAME	G&N LAB TEST REQUIREMENT	PSAAM AND/OR SCA UNCERTAINTY % OF FULL SCALE
OG 2249 link 5	YAW Attitude Error	5.05±0.5V rms at 17°	1%
OG 2250 link 4	MG CDU Fine Error	0.0±0.07V rms at null	1%
OG 2251 link 4	MG CDU Coarse Error	0.0±0.68V rms at null	1%
OG 2279 link 5	Roll Attitude Error	5.05±0.5V rms at 17°	1%
OG 2280 link 4	OG CDU Fine Error	0.0±0.07V rms at null	1%
OG 2281 link 4	OG CDU Coarse Error	0.0±0.68V rms at null	1%
OG 2300 link 5	PIPA Temperature	130.5 ± 1.5°F in Operate	1%
OG 2301 link 4	IRIG Temperature	135 ± 2.5°F in Operate	1%
OG 2301 link 5	IRIG Temperature	135 ±°2.5°F in Operate	1%
OG 2302 link 4	IMU Heater Current On	28±1 vdc	0%
OG 2303 link 4	IMU Blower Current On	28±1 vdc	0%
OG 3304 link 5	RR Shaft 1X Resolver Out-Sine	19.65±0.98V rms at 45°	2.5%
OG 3305 link 5	RR Shaft 1X Resolver Out-Cosine	19.65±0.98V rms at 45°	2.5%
OG 3311 link 4	RR Shaft CDU Fine Error	0.0±0.07V rms at null	1%
OG 3312 link 4	RR Shaft CDU Coarse Error	0.0±0.68V rms at null	1%
OG 3321 link 4	RR Trunnion CDU Fine Error	0.0±0.07V rms at null	1%
OG 3322 link 4	RR Trunnion CDU Coarse Error	0.0±0.68V rms at null	1%
OG 3324 link 5	RR Trunnion 1X Resolver Out-Sine	19.65±0.98V rms at 45°	2.5%
OG 3325 link 5	RR Trunnion 1X Resolver Out-Cosine	19.65±0.98V rms at 45°	2.5%
OG 4300 link 4	LGC Temperature	87.5±42.5°F	0%
OG 6020 link 4	PIPA Calibration Module Temperature	67.5±22.5°F	0%
OG 6020 link 5	PIPA Calibration Module Temperature	67.5±22.5°F	0%
OG 6021 link 4	PSA Temperature	85±25.0°F	0%
NG 1336 link 4	PHDIFF 3.2KC 28V/LGC SYNC	0° ±10°	3%

* Link 4 - PSAAM Output Signal

** Link 5 - SCA Output Signal

ADDENDUM I

LEM 1

ADDITION 1: The following procedure will be performed for LEM 1 only.

6.3.18 Gyrocompassing Test

6.3.18.1 Inertial Instrument Calibration data Load.

6.3.18.1.1 On K-148 enter:

```
VERB 21  NOUN 01          ENTR
01436                     ENTR
XXXXX    (X PIPA BIAS)    ENTR
                          ENTR
01437                     ENTR
XXXXX    (X PIPA S.F.)    ENTR
                          ENTR
01440                     ENTR
XXXXX    (Y PIPA BIAS)    ENTR
                          ENTR
01441                     ENTR
XXXXX    (Y PIPA S.F.)    ENTR
                          ENTR
01442                     ENTR
XXXXX    (Z PIPA BIAS)    ENTR
                          ENTR
01443                     ENTR
XXXXX    (Z PIPA S.F.)    ENTR
                          ENTR
01444                     ENTR
XXXXX    (NBDX)           ENTR
                          ENTR
01445                     ENTR
XXXXX    (NBDY)           ENTR
                          ENTR
01446                     ENTR
XXXXX    (NBDZ)           ENTR
                          ENTR
01447                     ENTR
XXXXX    (ADIAX)          ENTR
                          ENTR
01450                     ENTR
XXXXX    (ADIAY)          ENTR
                          ENTR
01451                     ENTR
XXXXX    (ADIZ)           ENTR
                          ENTR
01452                     ENTR
XXXXX    (ADSRAX)         ENTR

                          ENTR
```

6.3.18.1.1 (cont)

01453	ENTR
XXXXX (ADSRAY)	ENTR
	ENTR
01454	ENTR
XXXXX (ADSRAZ)	ENTR
	ENTR
2506 (ZNBAZ)	ENTR
67777	ENTR
	ENTR
02507	ENTR
77777	ENTR
	ENTR
02510 (LAT)	ENTR
02422	ENTR
	ENTR
02511	ENTR
20416	ENTR

6.3.18.2 Non-Standard Gyrocompassing Position Vector Load.

6.3.18.2.1 On K-148 enter:

VERB 21 NOUN 01	ENTR
02720	ENTR
15666	ENTR
	ENTR
02721	ENTR
17272	ENTR
	ENTR
02722	ENTR
73605	ENTR
	ENTR
02723	ENTR
56237	ENTR
	ENTR
02724	ENTR
71156	ENTR
	ENTR
02725	ENTR
54506	ENTR
	ENTR
02726	ENTR
10000	ENTR
	ENTR
02727	ENTR
00000	ENTR

6.3.18.2.1 (cont)

	ENTR
02730	ENTR
07257	ENTR
	ENTR
02731	ENTR
20033	ENTR
	ENTR
02732	ENTR
13600	ENTR
	ENTR
02733	ENTR
16506	ENTR
	ENTR
02734	ENTR
00000	ENTR
	ENTR
02735	ENTR
00000	ENTR
	ENTR
02736	ENTR
62334	ENTR
	ENTR
02737	ENTR
71216	ENTR
	ENTR
02740	ENTR
10365	ENTR
	ENTR
02741	ENTR
03117	ENTR

6.3.18.3 Gyrocompassing

6.3.18.3.1 On K-148 enter

VERB 57	ENTR
00007	ENTR

6.3.18.3.2 On K-148 enter:

VERB 33	ENTR
VERB 16 NOUN 20	ENTR

6.3.18.3.3 One hour after step 6.3.18.3.8 has been performed, read and record CRT DSKY display of Row 1, Row 2, and Row 3.

6.3.18.3.4 The Row 1 indication shall be within ±000.57 degrees of desired launch azimuth.

6.3.18.3.5 Row 2 shall indicate 000.00±000.06 degrees and Row 3 shall indicate 030.00±000.06 degrees.

6.3.18.3.6 Two hours after performing paragraph 6.3.18.3.8 record CRT DSKY display of Row 1, Row 2, and Row 3.

6.3.18.3.7 The CRT DSKY display of Row 1 shall be within ±000.06 degrees of the value recorded in 6.3.18.3.3. The CRT DSKY display of Row 2 and Row 3 shall be within ±000.03 degrees of the respective values recorded in 6.3.18.3.9.

6.3.18.3.8 On K-148 enter the following:

VERB 36		ENTR
VERB 40	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

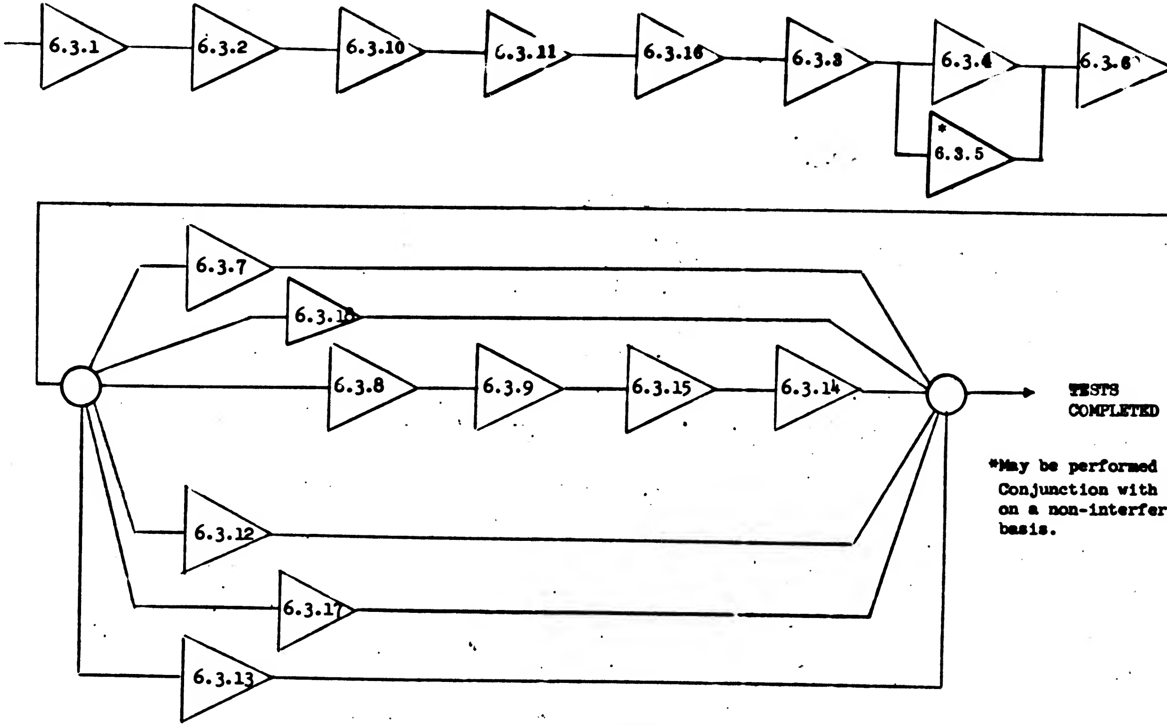
ADDENDUM 1

LEM 1

Addition 2: Perform LEM 1 test in accordance with the Following Flowgram.

Addition 3: Place a note after paragraph 6.3.1.5.2.

NOTE: Before performing the following step insure that the ATCA switch on LEM Panel 16 and the ATCA/PGNCS switch on Panel 11 are in the off position.



*May be performed in Conjunction with 6.3.4 on a non-interference basis.

TEST PROCEDURE FLOWGRAM

FIGURE 1

APOLLO G&N Specification
ND 1002349 REV C
Original Issue Date:
Release Authority: TDRR 32362
Class A Release

POST INSTALLATION CHECKOUT
SPECIFICATION FOR LM G&N SYSTEM (KSC)

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approval
3/31/67	A	33482	2, 3, 5-75; was 75 pages, now 83 pages.	MGM EA
6/30/67	B	34079	1, 2, 6-18, 20-86; Was 83 pages now 86 pages.	EA
8/24/67	C	34437	19	EA

This specification consists of page 1 to 86 inclusive.

APPROVALS	NOT REQUIRED CCA497-0274 NASA/MSC	12/2/66			ACED

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POST INSTALLATION CHECKOUT SPECIFICATION FOR LM G&N SYSTEM (KSC)

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approval
3/31/67	A	33482	2, 3, 5-75; was 75 pages, now 83 pages.	MGM EA
6/30/67	B	34079	1, 2, 6-18, 20-88; Was 83 pages now 86 pages.	EA
8/24/67	C	34437	19 ROG/AC	EA
10/12/67	D	34840	3, 5-86; was 86 pages, now 128 pages. ROG/AC	EA

This specification consists of page 1 to 128 inclusive.

APPROVALS	NOT REQUIRED CCA497C274 NASA/MSC	[illegible] 12/[illegible]			AC

Document Number	Subject
LIS-510-10001	Thermodynamic Requirements of Guidance & Navigation Equipment - GAEC
LIS-520-10001	LEM Design Environment
LIS-350-10002	LEM-PGNS Lateral and Forward Velocity Interface
LIS-370-10007	LEM-PGNS 800 CPS Power Electrical Interface
LIS-370-10003	LEM-PGNS Measurement Interface
LIS-370-10004	LEM-LGC Electrical Interface
LIS-390-10002	Guidance and Navigation Prime Power Requirements and Characteristics
LID-410-10002	ICTC System Interface
LID-410-10003	PSA Adapter Module Interface
PS6015000	Master End Item Specification, Product Configuration and Acceptance Test Requirements, PGNCS Spacecraft Equipment

3.2 The following addendum are applicable to this document.

3.2.1 Addendum 1 LEM 1.

3.2.2 Addendum II RR CDU Testing.

3.2.3 Addendum III DANCE G&N System Tests.

ITEM	DESCRIPTION	MODEL NO.
30	5 Place Sine-Cosine Tables, Friden Calculator	
31	Dioptometer	

5. GENERAL REQUIREMENTS

5.1 Safety Requirements

5.1.1 Operator Safety

5.1.1.1 Normal safety precautions shall be observed through the G&N post-installation checkout.

5.1.2 Equipment Safety

5.1.2.1 To preserve the operational life of the components of the G&N hardware under test, settings and adjustments shall be performed only when specified in the test procedure. Care shall be exercised in the accomplishment of all settings and adjustments to avoid excessive wear or damage to the equipment. All precautionary measures stated throughout the test procedures shall be strictly adhered to.

5.1.2.2 The connection between the Portable Temperature Controller (PTC) and 56J1 shall be maintained unless otherwise specified.

5.1.2.3 The temperature of the inertial components shall be maintained between the following limits. If these limits are exceeded, the inertial components shall be recalibrated.

a. IRIG: 120 Deg F and 150 Deg F
b. PIP: 115 Deg F and 145 Deg F

5.1.2.4 All personnel concerned shall thoroughly understand the Operational Requirements in Section 6.2 to preclude any damage to the G&N System.

5.1.2.5 To preserve the operational life of the components of the DSKY, the monitor routines shall be used only when required by test procedure or trouble shooting. Such routines shall be terminated as quickly as possible in the test flow. Computer routines which cause the DSKY display to flash (either requesting data or displaying data) shall also be terminated as quickly as possible.

5.2 Coolant Requirements

5.2.1 When electrical power is applied to the G&N System, the IMU shall be provided with water-glycol coolant at a temperature of 32 to 60 deg F and a flow rate of 28-76 pounds per hour.

5.2.2 The PSA, CDU, and PTA cold plates shall be provided with coolant as per ICD LIS-510-10001.

5.3 Test Equipment Tolerances

5.3.1 Measurements and tolerances specifications stated herein are basic G&N System performance specifications. Calibration data must be supplied to the Acceptance Checkout Equipment (ACE) for the Power and Servo Assembly Adapter Module (PSAAM) and Signal Conditioner Assembly (SCA) performance. Final tolerances must include PSAAM and Signal Conditioner stability uncertainties (See Appendix 1) as well as ACE and ACE carry-on conditioning uncertainties. ~~[illegible]~~

5.3.2 In the event of a conflict between requirements, the following order of precedence shall apply. The contractor shall also notify AC Electronics Site Manager of the conflict.

a. The contract
b. The Specification
c. Documents referenced in this specification.

5.4 Test Sequence

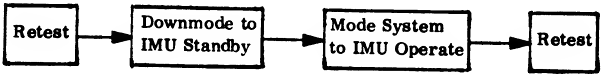
5.4.1 The test sequence shall normally follow the flow gram in Figure 2. Any test subsequent to Temperature Control Verification Section 6.3.4 may be conducted providing the General Turn On Procedure 6.2.4 is followed.

5.5 The generation of noise alarm indication, as evidenced by one or more Noise Peak Event Lamps becoming lighted shall be cause for immediate determination of effects on the G&N system test in progress. In the event of detrimental effects on the system test a troubleshooting routine shall be entered to determine the cause of the alarm. Testing shall continue only after demonstrating that the cause of the noise alarm has been located and that remedial action has been or will be taken, or that the transient or noise causing the alarm has no detrimental effect on the G&N System or test in progress.

5.6 Test Failure Criteria

5.6.1 IRIG and PIPA data (See paragraph 6.3.9)

5.6.1.1 If D_1, D_2, or D_3 exceeds its maximum value as specified in 6.3.9 for any IRIG or PIPA, a retest sequence shall be initiated as indicated below:



RETEST SEQUENCE

The retest sequence shall be performed using the paragraphs indicated in Table 4 corresponding to the out-of-spec parameters. Table 5 indicates the test positions and other isolated parameters that must be recalculated and qualified.

If D_1, D_2, and D_3 are within tolerance after the retest sequence is completed, the original out-of-tolerance terms calculated in 6.3.9.70.4 shall be exonerated.

~~[illegible] tolerance after the retest sequence is [illegible] [illegible] in paragraph [illegible] shall [illegible].~~

5.6.1.2 Failure to be within the maximum values of D_1, D_2, and D_3 after the retest sequence of 5.6.1.1 shall constitute a failure of the assembly.

5.6.2 Failure of the G&N System to pass any examination or test specified herein shall tentatively classify the G&N system as non-conforming. Normal test sequence may be continued upon determination of the cause of the nonconformance or at the discretion of the G&N contractor test team if it is determined that such action is not detrimental to the G&N System or other interfacing subsystems. All nonconformances shall be investigated and cleared by waivers (F.N.N), correction of specification, or hardware replacement and retest. The suspected malfunctioned hardware shall be removed and returned to the laboratory where the malfunction shall be verified. Only after malfunction verification shall a flight certified replaceable element be installed in the G&N System.

5.7 Retest subsequent to replacement of a malfunctioned assembly with that of a flight certified assembly shall be at the discretion of NASA Engineering. Table I can be used as a guide to determine general retest requirements. In all retest procedure, the test sequence of Figure 2 shall be adhered to. [illegible] Test [illegible], Figure 2.

5.8 It is assumed that the Test Conductor has a working knowledge of the test equipment used; therefore, this procedure contains only the steps pertaining directly to the G&N components. If any questions arise concerning the test equipment, the Test Conductor should refer to the respective operational manuals.

5.9 Spacecraft systems other than the G&N System may be operating on a noninterfering basis while individual system checkout of the G&N is being conducted.

5.10 Data Retrival

5.10.1 All data concerning the checkout and operation of the G&N System as monitored via ACE, shall be recorded on the data sheets associated with their corresponding test. Out of tolerance readings shall be recorded and flagged by appropriate signals.

5.10.2 During G&N System testing, all interleaved data, Uplink Command File and Downlink Data File shall be maintained (recorders ON). All A/B PCM data, that is not made available to the ACE displays shall be verified by requesting a time history data strip out of said data for the time period when the test was performed.

O.O.S. PARAMETERS	PARAGRAPH NUMBERS																																																										
	6.3.9 → 6.3.9.11	6.2.9.X where X is listed below																																																									
		12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
NBDX	X																X	X	X																																						X		X
NBDY	X	X	X	X																																																					X		X
NBDZ	X								X	X	X																																														X		X
ADSRAX	X																X	X	X																						X	X	X	X													X		X
ADSRAY	X	X	X	X																		X	X	X	X																																X		X
ADSRAZ	X								X	X	X																																						X	X	X	X					X		X
ADIAX	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X																																						X		X
ADIAY	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X																						X	X	X	X									X	X	X	X	X		X
ADIAZ	X								X	X	X					X	X	X	X			X	X	X	X	X	X	X	X	X																											X		X
X PIPA BIAS & S.F. ERROR	X	X	X	X	X	X	X	X	X	X	X	X	X																																												X		X
Y PIPA BIAS & S.F. ERROR	X																															X	X	X	X	X	X	X	X	X	X	X	X														X*		X
Z PIPA BIAS & S.F. ERROR	X																X	X	X	X	X	X	X	X	X	X	X	X																													X		X

TABLE 4

*Wait until GIMBAL LOCK lamp goes out before performing this step.

TABLE 5

O.O.S PARAMETER	PERFORM POSITIONS	PARAMETERS TO BE REQUALIFIED
NBDY	1	NBDY
NBDZ	2	NBDZ
NBDX	3	NBDX
ADSRAY	1 and 4	ADSRAY, NBDY
ADSRAZ	2 and 9	ADSRAZ, NBDZ
ADSRAX	3 and 7	ADSRAX, NBDX
ADIAY	1 thru 3, 7 thru 10	NBDY, NBDX, ADIAX, ADSRAX, ADIAY, NBDZ
ADIAZ	2 thru 4	NBDZ, NBDX, ADIAZ
ADIAX	1 thru 3	NBDX, NBDZ, ADIAX, NBDY
X PIPA Bias or S. F.	1 thru 2	X PIPA BIAS, NBDY, NBDZ, X PIPA S. F.
Y PIPA Bias or S. F.	5 and 6	Y PIPA BIAS Y PIPA S. F.
Z PIPA Bias or S. F.	3 and 4	Z PIPA Bias, NBDX Z PIPA S. F.

Paragraph No.	Test Title
6.3.1	Standby Power In Test
6.3.2	Alarms and Interrupts Test
6.3.3	IMU Operate Power On Test
6.3.4	Temperature Control Verification
6.3.5	PGNCS Power Supply Test
6.3.6	IMU Operational Test
6.3.7	PGNCS Operational Test
6.3.8	IRIG Scale Factor Test
6.3.9	IMU Performance Test
6.3.10	LGC Voltage Margin Test
6.3.11	LGC Clock Frequency Test
6.3.12	Gimbal Friction Test
6.3.13	Stabilization Loop Response Test
6.3.14	G and N Fine Alignment Test
6.3.15	AOT Functional Performance Test
6.3.16	Flight Rope Fixed Memory Bank Sum Check
6.3.17	LGC Clock Alignment Test

G&N TESTS

FIGURE 1

6. DETAILED REQUIREMENTS

6.1 Initial Test Conditions

6.1.1 The IMU shall be supplied with heater power on a continuous basis. The portable temperature controller (Model No. 410-31058) shall be connected at all times although heater power may be supplied from the +28 VDC IMU STANDBY bus and monitored through ACE.

6.1.2 The IMU shall never be without heater power longer than 15 minutes.

6.2 Operational Requirements

TABLE I RETEST SEQUENCE

Paragraph Number	Test Title	LGC	IMU	PSA	CDU	PTA	DSKY	A HARNESS	B HARNESS	Computer Control & Reticle Dimmer	Nav Base	Alignment Optical Telescope	Signal Conditioner
6.3.1	Standby Power On Test	X	X	X			X	X	X		X		
6.3.2	Alarms and Interrupts Test	X					X	X					
6.3.3	IMU Operate Power On Test		X	X	X	X		X	X		X		X
6.3.4	Temperature Control Verification		X	X				X	X		X		X
6.3.5.	PGNCS Power Supply Test			X	X	X		X	X		X		X
6.3.6	IMU Operational Test	X	X	X	X	X		X	X		X		
6.3.7	PGNCS Operational Test		X	X	X			X	X		X		X
6.3.8	IRIG Scale Factor Test		X	X		X		X	X		X		
6.3.9	IMU Performance Test		X	X		X		X	X		X		
6.3.10	LGC Voltage Margin Test	X						X					
6.3.11	LGC Clock Frequency Test	X						X		X			
6.3.12	Gimbal Friction Test		X	X				X	X		X		X
6.3.13	Stabilization Loop Response Test		X	X		X		X	X		X		
6.3.14	G&N Fine Alignment Test		X	X	X			X	X		X	X	
6.3.15	AOT Functional Performance Test											X	
6.3.16	Flight Rope Fixed Memory Bank Sum Check	X						X					
6.3.17	LGC Clock Alignment Test	X						X					
6.2.1	Emergency Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.2	Normal Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.3	Initial Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.4	General Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*

* To be used as necessary to turn system on or off.

6.2.1 Emergency Shutdown Procedure

CAUTION

In the event of any malfunction which might damage the G&N System before the normal shutdown procedure in 6.2.2 can be performed, power shall be removed from the G&N System as soon as possible. If at all possible, without creating any delay, IMU Operate Power should be removed first.

6.2.2 Normal Shutdown Procedure

6.2.2.1 The normal shutdown of a G&N System shall include parking the gimbals prior to removing IMU Operate Power. This is accomplished in the following procedure.

6.2.2.2 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+09000 ENTR

6.2.2.3 On the CRT, verify the following platform angles are displayed:

IG is between 358 and 002
MG is between 088 and 092
OG is between 358 and 002
Verify Gimbal Lock Lamp is lighted.

6.2.2.4 Pull out +28 VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11 to remove IMU OPERATE power.

6.2.2.4.1 On K-148 enter the following:

VERB 21	NOUN 01	ENTR
00326		ENTR
00000		ENTR

Verify that NO ATT and GIMBAL LOCK lamp indications are OFF.

6.2.2.5 Pull out +28 VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11 to remove LGC OPERATE power.

6.2.2.6 Pull out +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11 to remove IMU STANDBY power.

6.2.3 Initial Turn-On Procedure

6.2.3.1 Proper coolant flow shall be verified prior to application of any power to the G&N System.

6.2.3.2 The initial power turn-on sequence shall be in the order specified in the test procedures (6.3) observing all cautions and delays as specified.

6.2.4 General Turn-On Procedure

6.2.4.1 This step shall be effective only after having completed the initial turn-on procedures.

6.2.4.2 Proper coolant flow shall be verified.

6.2.4.3 Depress +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11 to supply IMU STANDBY power. Record time.

6.2.4.4 Depress +28 VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11 to supply LGC Operate Power. The Restart lamp may come on; if it does press RSET on the DSKY.

6.2.4.6 On K-148 enter the following sequence:

Press ERROR RESET
VERB 36 ENTR (fresh start)
VERB 57 ENTR
00015 ENTR
VERB 21 NOUN 27 ENTR
77777 ENTR (LGC Self Check)

6.2.4.7 On the CRT, verify that the 3.2KC 28V Supply indicates between 28.04 and 29.16 VRMS (GG 1331).

6.2.4.8 Verify that PROG caution lamp does not come on for the next 5 minutes. (indicating [illegible] [illegible]).

6.2.4.9 After 5 minutes enter the following in K-148:

a. VERB 34 ENTR
b. VERB 21 NOUN 27 ENTR
c. 00000 ENTR
d. VERB 25 NOUN 01 ENTR
e. 03770 ENTR SET LOC
f. 10067 ENTR CCS NEW JOB
g. 05532 ENTR TC CHANG1
h. 01770 ENTR TC ACTLITON
i. VERB 25 NOUN 26 ENTR CALL PRIO/DELAY
j. 01000 ENTR 01 PRIORITY
k. 01770 ENTR RELATIVE E-MEM
m. 00007 ENTR BANKADD.
n. VERB 30 ENTR REQ EXEC.

NOTE: If a VERB 36 is performed after the above information has been entered repeat lines 6.2.4.9.i through 6.2.4.9.n.

6.2.4.10 **CAUTION:** LGC OPERATE and IMU STANDBY power must have been applied a minimum of two hours before energizing the IMU OPERATE circuit breaker in step 6.2.4.16 unless all of the following conditions are met:

IF:

1. The G&N System has previously been in Standby Mode at least two hours and subsequently been in Operate Mode, AND
2. The gimbals were placed in a parked position prior to shutdown, AND
3. The shutdown period did not exceed 5 days, AND
4. The Spacecraft or IMU have not been moved in any way during the shutdown period.

THEN: The two-hour Standby Mode operation requirement is reduced to 15 minutes.

6.2.4.11 The G&N System is defined as being in Standby Mode when LGC Operate and IMU Standby power is applied and IMU Operate power is off. The inertial components shall have suspension power in Standby Mode.

6.2.4.12 The G&N System is defined as being in Operate Mode when LGC OPERATE, IMU STANDBY and IMU OPERATE POWER is applied to the system.

6.2.4.13 Set up analog recorder to monitor the following signals:

Signal No.		Signal Name
a.	GG 2136	MG Servo Error Total
b.	GG 2106	IG Servo Error Total
c.	GG 2166	OG Servo Error Total
d.	GG 2112	IG 1X Resolver Sine
e.	GG 2172	OG 1X Resolver Sine
f.	GG 2142	MG 1X Resolver Sine
g.	GG 1201	IMU 28V 1φ 800 CPS

6.2.4.14 Start the analog recorder at a chart speed of 5 mm/sec. Start the event recorder at a chart speed of 1. mm/sec. ([illegible]).

6.2.4.15 On CRT, monitor +120 VDC PIPA SUPPLY (GG 1040) and IMU Gimbal angles. Record time. If 15 minutes have elapsed since performing paragraph 6.2.4.3 proceed to the next paragraph.

6.2.4.16 Press in +28VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11. Record time.

6.2.4.17 Verify on the analog recorder that the oscillations of the resolver sine signals (GG 2112, GG 2172, and GG 2142) are not sustained and that the signals damp out within 15 seconds. If this condition is not attained, remove IMU OPERATE power immediately.

6.2.4.18 On the CRT, verify absence of +120 VDC PIPA SUPPLY voltage for 90 ± 10 seconds after step 6.2.4.16 is initiated. Verify that this voltage is between 114 and 126 after 100 seconds from step 6.2.4.16.

6.2.4.19 Verify absence of LGC WARNING, ISS WARNING, and PGNCS CAUTION lights in the LEM cabin.

6.2.4.20 On the CRT, verify all IMU Gimbal angles between 358 and 002.

6.2.4.21 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.2.4.22 On the CRT, scan the power supply voltages to verify their normal operation. (No indications flashing).

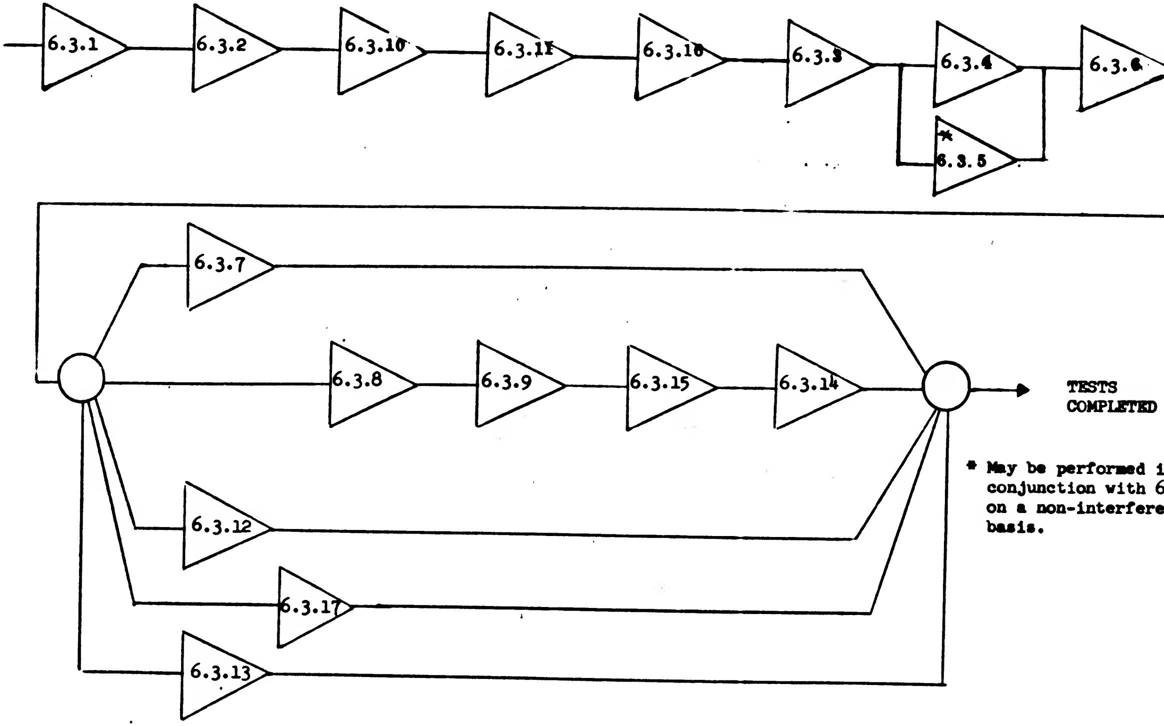
6.2.4.23 After all the tests of 6.3 in Figure 1 have been completed, the General Turn-On Procedure (6.2.4) and IMU Operational Test (6.3.6) shall be completed before re-running any test. Otherwise, the testing sequence shall continue in accordance with Figure 2.

6.2.5 Interruption of Power.

6.2.5.1 IMU Operate power shall never be applied without the presence of LGC Operate and IMU Standby Power.

6.2.5.2 The G&N System log book shall include the gimbal positions at time of power shutdown. If omitted, it shall be assumed that the gimbals were not parked prior to shutdown. The logbook shall also state if any movement of the IMU or Spacecraft has taken place after shutdown. The times of application and removal of any bus power to the G&N System shall be recorded.

6.2.5.3 After the system has been operating with IMU Operate power on, and a power interruption occurs, immediately set the IMU Operate power circuit breaker to OFF. When power is restored a minimum of 15 minutes operation in Standby Mode is required before resuming IMU Operate power. If the power interruption was longer than 15 minutes, the G&N System shall be run in Standby Mode for a time interval at least equal to the duration power was off before resuming IMU Operate power. However, this period need not exceed two hours before application of IMU Operate power.



* May be performed in conjunction with 6.3.4 on a non-interference basis.

TEST PROCEDURE FLOWGRAM

FIGURE 2

6.2.6 A warmup period of at least one hour in Operate Mode is required prior to performing any test in which gyro or accelerometer parameters are measured, and at least 15 minutes prior to any test in which precision amplitude and frequency power supply checks are made.

6.3 Test Procedures

6.3.1 Standby Power On Tests

6.3.1.1 The Portable Temperature Controller, Model No. 400-31058 shall be supplying inertial component heater power to the G&N System through connector 56J1 (P230). If alarm or fail indications are present on the PTC, they shall be cleared by depressing the SYSTEM RESET pushbutton on the PTC.

6.3.1.2 The following switches and/or circuit breakers shall be closed to energize the indicated buses.

LOCATION	NOMENCLATURE	IDENTIFICATION
Panel 14	BAT 5 NORMAL FEED	4S10
Panel 14	BAT 6 NORMAL FEED	4S11
Panel 16	X LUNAR BUS TIE	4CB5
Panel 16	BAT 1-4-6 FEED TIE	4CB17
Panel 16	BAT 2-3-5 FEED TIE	4CB25
Panel 16	ASC ECA	4CB14
Panel 16	ASC ECA CONT.	5CB7
Panel 16	DC BUS VOLT	4CB21
Panel 16	DISP.	4CB16
Panel 11	X LUNAR BUS TIE	4CB4
Panel 11	BAT 1-4-6 FEED TIE	4CB18
Panel 11	BAT 2-3-5 FEED TIE	4CB26
Panel 11	ASC ECA	4CB15
Panel 11	ASC ECA CONT.	4CB6
Panel 11	DC BUS VOLT	4CB22
Panel 16	INV. NO. 2	4CB13
Panel 14	AC PWR to INV 2 Position	4S14
Panel 11	AC BUS FEED TIE	4CB24
Pannel 11	AC BUS VOLT	4CB27

6.3.1.3 IMU Standby Power Turn On

6.3.1.3.1 Turn on Event Recorder to a speed of 10 mm/sec.

6.3.1.3.2 Press in +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11. Record time.

6.3.1.3.3 Verify on the Event Recorder that +28 VDC IMU STANDBY power discrete (GG 1513) is on. On CRT +28V IMU STANDBY Bus (GG 1510) shall indicate between 24.5 and 33.5

6.3.1.3.4 The PIPA TEMP, displayed on CRT, shall be monitored periodically one hour to ensure that the PIPA Temperature Control circuitry is operating to maintain a temperature of 130±5.0 Deg. F. (GG 2300). One hour after performing step 6.3.1.3.2 record PIPA TEMP. The PIPA Temperature shall be 130.5° ±1.5°F. The IRIG temperature shall be within 3.0°F of the PIPA Temperature.

6.3.1.4 Computer Power Turn On

6.3.1.4.1 Press in +28VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11.

6.3.1.4.2 On CRT, +28V LGC Operate Bus (GG 1520) shall indicate between 24.5 and 33.5. Ignore computer alarm indications. Verify on event recorder that +28V LGC OP (GG 1523X) discrete is on. Using DSKY, enter VERB 36 ENTR then press RSET. All computer alarms shall clear.

6.3.1.4.3 On CRT, the +14VDC LGC SUPPLY (GG 1020) shall indicate between 13.6 and 14.4 VDC. Record this value.

6.3.1.4.4 On CRT the 28V 3200 CPS SUPPLY (GG 1331) shall indicate between a 28.04 and 29.16 VRMS. Record this value.

6.3.1.5 LGC Operational Tests

6.3.1.5.1 DSKY Check

6.3.1.5.1.1 Initiate the DSKY check by entering in the DSKY:
Press Error Reset
VERB 57 ENTR 00015 ENTR (clear erasable memory)
VERB 21 NOUN 27 ENTR
00011 ENTR

6.3.1.5.1.2 All the electroluminescent elements (PROG, VERB, NOUN and Row 1, Row 2, Row 3) shall display the decimal number nine (9). Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0/s
k. Minus signs in ROW 1, ROW 2, ROW 3 }
l. VERB-NOUN Flashing } On concurrently for 5 seconds
m. COMP ACTY }

o. Plus signs in ROW 1, ROW 2, ROW 3 } On concurrently for 5 seconds
p. VERB-NOUN Flashing
q. COMP ACTY
r. COMP ACTY - On for 5 seconds then DSKY blanks

6.3.1.5.1.3 The DSKY pushbuttons shall be checked by entering:
VERB 25 NOUN 01 ENTR
03375 ENTR
+00123 ENTR
-00456 ENTR
-00789 DO NOT press ENTR

The DSKY shall display +00123 in Row 1, -00456, in Row 2, and -00789 in Row 3. Press CLR pushbutton three times on DSKY. Observe that Row 1, Row 2 and Row 3 are blank.

6.3.1.5.2 Lamp Test

6.3.1.5.2.1 Initiate the Lamp Test by entering in the DSKY:
VERB 35 ENTR

6.3.1.5.2.2 The following DSKY displays shall illuminate for approximately 5 seconds.

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in Row 1 Row 2 and 3.

} On currently for approximately 5 seconds.

On CAUTION/WARNING panel, the following displays shall illuminate, then extinguish.
LGC
ISS
PGNS

6.3.1.5.3 Uplink Check

6.3.1.5.3.1 On K-START 148, set LOAD/INHIBIT switch to LOAD, set TAPE/KEY switch to KEY, then enter the following:

ERROR RESET
VERB 25 NOUN 01 ENTR
03375 ENTR
+01234 ENTR
-56789 ENTR
+00000 ENTR

6.3.1.5.3.2 Verify the following is displayed on the DSKY

VERB 23 NOUN 01
R1 + 01234
R2 - 56789
R3 + 00000

6.3.1.5.4 Downlink Check

6.3.1.5.4.1 On CRT, DSKY display verify the following is displayed:

VERB 23 NOUN 01
R1 + 01234
R2 - 56789
R3 + 00000

6.3.1.5.5 LGC Self-Check

6.3.1.5.5.1 On K-148 enter the following sequence to initiate the LGC Self-Check:

VERB 36	ENTR	
VERB 21	NOUN 27	ENTR
77777		ENTR
VERB 15	NOUN 01	ENTR
01366		ENTR

6.3.1.5.5.2 On the CRT verify that DSKY R1 does not display 01102 or 41102. If a malfunction occurs, the following is displayed:

R1 01102 or 41102
R2 XXXXX c(S FAIL) program address +1 of point of failure
R3 XXXXX number of fails

6.3.1.5.5.3 When R3 = 00002, stop the LGC Self Check by entering in K-148 the following:

VERB 21	NOUN 27	ENTR
00000		ENTR

6.3.1.5.6 LGC Standby Check

6.3.1.5.6.1 On K-148 enter the following sequence:

VERB 21	NOUN 10	ENTR
00013		ENTR
02000		ENTR

6.3.1.5.6.2 On DSKY depress STBY pushbutton for approximately 3 seconds.

6.3.1.5.6.3 Verify STBY status indicator lamp is ON.

6.3.1.5.6.4 On the CRT, verify the 3.2 KC 28V Supply (GG 1331) is between 28.04 and 29.16 V RMS.

6.3.1.5.6.5 On DSKY depress STBY pushbutton for approximately 3 seconds to return to LGC OPERATE mode.

6.3.1.5.6.6 Verify STBY status indicator lamp is OFF.

6.3.1.5.7 Standby/Proceed Check

6.3.1.5.7.1 On K-148 enter the following:

```
VERB 11    NOUN 10    ENTR
00032                 ENTR
```

6.3.1.5.7.2 On the DSKY press and hold the STBY pushbutton. Verify Row 1 of the DSKY displays 57777.

6.3.2 Alarms and Interrupts Test

6.3.2.1 Parity Fail Test

6.3.2.1.1 On K-148 enter the following sequence

```
VERB 21    NOUN 02    ENTR
03377                 ENTR
33777                 ENTR
```

6.3.2.1.2 On CRT, DSKY display, verify R1 = 33777 and R3 = 03377

6.3.2.1.3 On K-148 enter the following sequence

```
VERB 25 NOUN 26 ENTR
04000 ENTR
01777 ENTR
00006 ENTR
VERB 30 ENTR
```

6.3.2.1.4 Verify RESTART, and PGNCS CAUTION lamps are ON.

6.3.2.1.5 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.2.2 Rupt Lock-Interrupt Too Long

6.3.2.2.1 On K-148 enter the following sequence

```
VERB 24 NOUN 01 ENTR
03377 ENTR
30001 ENTR
03377 ENTR
VERB 25 NOUN 26 ENTR
00001 ENTR
01777 ENTR
00006 ENTR
VERB 31 ENTR
```

6.3.2.2.2 Verify RESTART, and PGNCS CAUTION lamps are ON.

6.3.2.2.3 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.2.3 TC Trap Test

6.3.2.3.1 On K-148 enter the following sequence

```
VERB 21 NOUN 01 ENTR
03377 ENTR
03377 ENTR
VERB 25 NOUN 26 ENTR
04000 ENTR
01777 ENTR
00006 ENTR
VERB 30 ENTR
```

6.3.2.3.2 Verify RESTART, and PGNCS CAUTION lamps are ON.

6.3.2.3.3 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.2.4 **Nightwatchman Test**

6.3.2.4.1 On K-148 enter the following sequence

VERB 24 NOUN 01 ENTR
03377 ENTR
30001 ENTR
03377 ENTR
VERB 25 NOUN 26 ENTR
03400 ENTR
01777 ENTR
00006 ENTR
VERB 30 ENTR

6.3.2.4.2 Verify RESTART, and PGNCS CAUTION lamps are ON.

6.3.2.4.3 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.3 IMU OPERATE POWER ON TESTS

CAUTION

Prior to application of IMU OPERATE power in step 6.3.3.1.4, LGC OPERATE and IMU STANDBY power must have been applied to the G&N System continuously for a minimum of two hours. The only exception is when the requirements of step 6.2.4.10 are met and this does not apply for the initial application of IMU OPERATE power.

NOTE: Perform the following DSKY entries before continuing:

a.	VERB 25	NOUN 01	ENTR	
b.	03770		ENTR	SET LOC
c.	10067		ENTR	CCS NEW JOB
d.	05532		ENTR	TC CHANG1
e.	01770		ENTR	TC ACTLITON
f.	VERB 25	NOUN 26	ENTR	CALL PRIO/DELAY
g.	01000		ENTR	01 PRIORITY
h.	01770		ENTR	RELATIVE E MEMORY
i.	00007		ENTR	BANK ADD
j.	VERB 30		ENTR	REQ EXEC.

If a VERB 36 is performed after the above information has been entered repeat lines f through j.

6.3.3.1 **Verification of Power Turn-On**

6.3.3.1.1 Set up analog recorder to monitor the following signals:

SIGNAL NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2106	IG Servo Error Total
c. GG 2166	OG Servo Error Total
d. GG 2112	IG 1X Resolver Sine
e. GG 2172	OG 1X Resolver Sine
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1% 800 cps
h. SPARE	

6.3.3.1.2 Start analog recorder to a chart speed of 5 mm/sec. Start event recorder at a chart speed of 1.0 mm/sec.

6.3.3.1.3 On CRT, monitor +120 VDC PIPA SUPPLY (GG 1040) and IMU gimbal angles.

6.3.3.1.4 Press in +28 VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11. Record time.

6.3.3.1.4.1 Verify that the "NO ATT" light on the DSKY is lighted.

6.3.3.1.5 Verify on analog recorder that the oscillations of the resolver sine signals (GG 2112, GG 2172, and GG 2142) are not sustained and that the signals damp out within 15 seconds. If they don't, remove IMU OPERATE power as soon as possible.

6.3.3.1.6 On the CRT, verify absence of +120 VDC PIPA SUPPLY voltage for 90±10 seconds after step 6.3.3.1.4 is initiated. Verify that this voltage is between 114 and 126 after 100 seconds from step 6.3.3.1.4.

6.3.3.1.7 On event recorder verify the following:

LGC WARNING is OFF (GG 9001)
ISS WARNING is OFF (GG 9002)
PGNCS CAUTION is OFF (GG 9003)

6.3.3.1.7.1 On DSKY, verify that the "NO ATT" Light is Off.

6.3.3.1.8 On CRT, verify all IMU gimbal angles indicate between 358 and 002.

6.3.3.1.9 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.4 Temperature Control Verification

6.3.4.1 When 15 minutes have elapsed from the time of IMU OPERATE power turn-on record PIPA TEMP (GG 2300). The PIPA TEMP shall be within 0.5° of the PIPA TEMP measured in 6.3.1.3.4. Start event recorder.

6.3.4.2 When 30 minutes have elapsed from the time of IMU OPERATE power turn-on record IRIG TEMP (GG 2301).

6.3.4.3 When 1 hour has elapsed from the time of IMU OPERATE power turn-on, monitor PIPA TEMP (GG 2300) and IRIG TEMP (GG 2301) on the CRT. Monitor and record temperature readings every 5 minutes for 30 minutes. Verify that each reading does not deviate from the average value of each signal by more than 0.1°F.

6.3.4.4 The PIPA Temp shall be 130.5 (±1.5)°F. The IRIG TEMP shall be 135 (±2.5°)F.

6.3.4.5 The PIPA TEMP recorded in step 6.3.4.4 shall be within 1.0°F of the temperature recorded in steps 6.3.1.3.4 and within 0.5°F of the PIPA TEMP recorded in 6.3.4.1.

6.3.4.6 The IRIG TEMP recorded in step 6.3.4.4 shall be within 0.5°F of the temperature recorded in step 6.3.4.2.

6.3.4.7 Verify on the event recorder that IMU Blower Current (GG 2303) and IMU Heater Current (GG 2302) On discretes have been present for the last hour (discretes may cycle off).

6.3.5 PGNCS Power Supply Tests

6.3.5.1 From the CRT, confirm power supply voltages (or temperatures) are as specified and record values observed.

6.3.5.2 The PIPA Calibration Module Temperature (GG 6020) shall be between +45 and +90 DEG F.

6.3.5.3 The PSA Temperature (GG 6021) shall be between +60 and +110 DEG F.

6.3.5.4 The LGC Temperature (GG 4300) shall be between +45 and +130 DEG. F.

6.3.5.5 The +28 VDC IMU OPERATE BUS (GG 1500) shall be between 24.5 and 33.5 VDC.

6.3.5.6 The +28 VDC IMU STANDBY BUS (GG 1510) shall be between 24.5 and 33.5 VDC.

6.3.5.7 The +28 VDC LGC OPERATE BUS (GG 1520) shall be between 24.5 and 33.5 VDC.

6.3.5.8 The +120 VDC PIPA Supply (GG 1040) shall be between 114 and 126 VDC.

6.3.5.9 The -28 VDC Supply (GG 1100) shall be between -21.5 and -33.5 VDC.

6.3.5.10 The +4 VDC CDU Supply (GG 1070) shall be between 3.8 and 4.2 VDC.

6.3.5.11 The IMU 28V/800 CPS 1 pct Supply (GG 1201) shall be between 27.44 and 28.56 VRMS.

6.3.5.12 The IMU 28V 800 CPS 5 pct 90 PH Supply (GG 1202) shall be between 26.6 and 29.4 VRMS.

6.3.5.13 The IMU 28V 800 CPS 5 pct 0 PH Supply (GG 1203) shall be between 25.9 and 30.1 VRMS.

6.3.5.14 The 3.2 KC 28V Supply (GG 1331) shall be between 28.04 and 29.16 VRMS.

6.3.5.15 The 2.5 VDC T/M Bias (GG 1110) shall be between 2.4 and 2.6 VDC.

6.3.5.16 The +14 VDC LGC Supply (GG 1020) shall be between 13.6 and 14.4 VDC.

6.3.5.17 The +4 VDC LGC Supply (GG 1030) shall be between 3.8 and 4.2 VDC.

6.3.5.18 The phase difference between the 3.2 KC supply and LGC sync shall be 0±10° (NG 1336).

6.3.5.19 Record the noise levels of the following signals displayed on the CRT.

Item No.	Measurement No.	Signal	Requirement
a.	NG 1021	14 VDC LGC Noise RMS	<0.4 VRMS
b.	NG 1031	4 VDC LGC Noise RMS	<0.4 VRMS
c.	NG 1071	4 VDC CDU Noise RMS	<1.0 VRMS
d.	NG 1501	28 VDC IMU Operate Noise RMS	<1.0 VRMS
e.	NG 1511	28 VDC IMU Standby Noise RMS	<1.0 VRMS
f.	NG 1521	28 VDC LGC Operate Noise RMS	<2.0 VRMS

6.3.5.20 The noise peaks of the following signals are demonstrated on the event light when the peaks have a rise time between 2 and 50 μsec and the peak voltage exceeds 5 volts.

Item No.	Measurement No.	Signal
a.	NG 1022	14 VDC LGC Noise Peak
b.	NG 1032	4 VDC LGC Noise Peak
c.	NG 1072	4 VDC CDU Noise Peak
d.	NG 1502	28 VDC IMU Operate Noise Peak
e.	NG 1512	28 VDC IMU Standby Peak
f.	NG 1522	28 VDC LGC Operate Peak

6.3.6 IMU OPERATIONAL TEST

6.3.6.1 On K-148 enter the following:

VERB 01 NOWN 10 ENTR
00003 ENTR
Record CRT DSKY Row 1 indication AAAAA and the time of day.

6.3.6.2 On K-148 enter the following:

VERB 21 NOUN 01 ENTR
03377 ENTR
AAAAA ENTR
VERB 06 NOUN 02 ENTR
03377 ENTR
Record CRT DSKY Row 1 indication as ±BBBBB

6.3.6.3 Perform the following calculations:

a. $\frac{\text{BBBBB} \times 5.12}{3600}$ = CCCC.C (Contents (hrs) of high order scalar register)

b. 23.3 - CCCC.C = DDDD.D hours

c. DDDD.D + time of day recorded in 6.3.6.1 = time of day at which high order scalar register will overflow.

6.3.6.4 If time of day is within 12 minutes of that calculated in 6.3.6.3.c when about to perform any of the following paragraphs, wait until that time calculated in 6.3.6.3.c has passed and proceed.

6.3.6.5 In K-148 enter the following sequence:

VERB 57 ENTR
00004 ENTR

6.3.6.6 Wait 200 seconds, then verify on the CRT, that the X, Y and Z PIPA SG Output signals all indicate 0.0±2.5 Volts but not 0.

6.3.6.7 Approximately 12 minutes after performing step 6.3.6.1, VERB 06 NOUN 66 shall flash.

6.3.6.8 From the CRT, DSKY display, read and record R1 and R2 (local gravity whole and fractional respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.3.6.9 On K-148 enter the following sequence

VERB 33 ENTR
VERB 06 NOUN 66 shall flash.

6.3.6.10 From the CRT, DSKY display, read and record the horizontal fractional component of earth rate acting on the X, Y, and Z IRIG's as displayed in R2. The value recorded shall be between .77882 and .97882.

6.3.6.11 Terminate the test by entering in K-148 the following:
VERB 33 ENTR
VERB 16 NOUN 40 DISPLAYED
VERB 34 ENTR
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.7 PGNCS Operational Test

6.3.7.1 Start the PGNCS Operational test by inserting the following sequence into K-148:

VERB 57 ENTR
00010 ENTR
05 shall be displayed
VERB 33 NOUN 01 is displayed flashing

6.3.7.2 Command Accuracy 0°

6.3.7.2.1 On K-148, press ENTR
VERB 33 NOUN 02 is Displayed Flashing
On Event Module Verify ISS WARNING Lamp Lights
Press ENTR
VERB 33 NOUN 03 is Displayed Flashing.

6.3.7.2.2 Read and record the CRT IMU Gimbal angles. The indications shall be 000±001 degree.

6.3.7.2.3 Read and record CRT the DSKY Row 1, 2, and 3 indications. The indications shall be +00000 ± 00030.

6.3.7.3 Command Accuracy 45°.

6.3.7.3.1 On K-148, press ENTR, VERB 33 NOUN 04 is displayed flashing after approximately 20 seconds.

6.3.7.3.2 Read and record the CRT IMU Gimbal angle. The indications shall be 045 ± 001 degrees.

6.3.7.3.3 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be +04500 ± 00030.

6.3.7.4 CDU Repeating Accuracy 45°

6.3.7.4.1 On K-148 press ENTR. In about 90 seconds VERB 05 NOUN 30 is displayed flashing.

6.3.7.4.2 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be between 77774 and 00003.

6.3.7.5 Command Accuracy 90°.

6.3.7.5.1 On K-148 Press VERB 33, ENTR. In approximately 20 seconds VERB 33 NOUN 06 is displayed flashing. The GIMBAL LOCK lamp on DSKY shall be lighted.

6.3.7.5.2 Read and record the CRT IMU Gimbal angle. The indications shall be 090 ± 001 degrees.

6.3.7.5.3 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indication shall be +09000 ± 00030.

6.3.7.6 Command Accuracy 135°.

6.3.7.6.1 On K-148 press ENTR. In approximately 20 seconds VERB 33 NOUN 07 is displayed flashing.

6.3.7.6.2 Read and record the CRT IMU Gimbal Angle indication. The indications shall be 135 ± 001 degrees.

6.3.7.6.3 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be +13500 ± 00030.

6.3.7.7 On K-148 press ENTR. In approximately 20 seconds VERB 33 NOUN 10 is displayed flashing. The GIMBAL LOCK lamp on DSKY shall not be lighted.

6.3.7.8 CDU Repeating Accuracy 135°.

6.3.7.8.1 On K-148 press ENTR pushbutton. In about 90 seconds, VERB 05 NOUN 30 is displayed flashing.

6.3.7.8.2 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be between 77774 and 00003.

6.3.7.9 + Gimbal Lock Test

6.3.7.9.1 On K-148, Press VERB 33, ENTR. In approximately 20 seconds VERB 33 NOUN 12 is displayed flashing. The GIMBAL LOCK lamp on DSKY shall be lighted.

6.3.7.10 Command Accuracy 225°.

6.3.7.10.1 On K-148 press ENTR. In approximately 20 seconds, VERB 33, NOUN 13 is displayed flashing.

6.3.7.10.2 Read and record the CRT IMU Gimbal Angle indications. The indication shall be 225±001 degrees.

6.3.7.10.3 Read and record CRT DSKY Rows 1, 2, and 3 indications. The indications shall be +225 00 ± 00030.

6.3.7.11 On K-148 press ENTR. In approximately 20 seconds VERB 33 NOUN 14 is displayed. The GIMBAL LOCK lamp shall not be lighted.

6.3.7.12 CDU Command Rate Test

6.3.7.12.1 On K-148 press ENTR. In approximately 30 seconds VERB 06 NOUN 66 is displayed flashing. The GIMBAL LOCK lamp on DSKY shall be lighted.

6.3.7.12.2 Read and record the CRT DSKY Row 1, 2, and 3 indications. The indication shall be between 00012 and 00016.

6.3.7.12.3 On K-148 insert VERB 33 ENTR. In approximately 30 seconds VERB 06 and NOUN 66 is displayed flashing. Repeat 6.3.7.12.2. The GIMBAL LOCK lamp on DSKY shall not be lighted.

6.3.7.12.4 On K-148 insert VERB 33 ENTR. In approximately 30 seconds VERB 06 and NOUN 66 is displayed flashing. Repeat 6.3.7.12.2. The GIMBAL LOCK lamp on the DSKY shall not be lighted.

6.3.7.13 Command Accuracy 315° .

6.3.7.13.1 On K-148 insert VERB 33 ENTR. In approximately 20 seconds VERB 33 NOUN 20 will be displayed flashing.

6.3.7.13.2 Read and record CRT IMU Gimbal Angles. The indicator shall be 315±001 degrees.

6.3.7.13.3 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be +31500±00030.

6.3.7.14 CDU Repeating Accuracy 315° .

6.3.7.14.1 On K-148 press ENTR. In approximately 90 seconds VERB 05 NOUN 30 is displayed flashing.

6.3.7.14.2 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be between 77774 and 00003.

6.3.7.15 -Gimbal Lock Test

6.3.7.15.1 On K-148 Press VERB 33 ENTR. In approximately 20 seconds VERB 33, NOUN 22 is displayed flashing. The GIMBAL LOCK lamp on DSKY shall be lighted.

6.3.7.15.2 On K-148 Press ENTR. In approximately 20 seconds VERB 33 NOUN 23 will be displayed flashing.

6.3.7.15.3 Read and record the CRT DSKY Rows 1, 2 and 3 indications. The indications shall be:

Row 1	22500±00030
Row 2	22500±00030
Row 3	22500±00030

6.3.7.16 CDU Repeating Accuracy 225° .

6.3.7.16.1 On K-148 press ENTR. In above 90 seconds, VERB 05 NOUN 30 is displayed flashing.

6.3.7.16.2 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indication shall be between 77774 and 00003.

6.3.7.17 On K-148 Press VERB 33 ENTR. The GIMBAL LOCK lamp shall not be lighted. VERB 21, NOUN 22 is displayed flashing.

6.3.7.18 IMU CDU Fine Fail Test

6.3.7.18.1 On K-148 insert the following sequence
+00100 ENTR
+00100 ENTR
+00100 ENTR
On Event Module verify that ISS WARNING lamp lights in approximately 90 seconds.

6.3.7.18.2 After approximately 20 seconds, VERB 01 NOUN 10 shall be displayed. Verify that CRT DSKY display Row 1 indicates 33XXX or 32XXX.

6.3.7.19 IMU CDU Coarse Fail Test

6.3.7.19.1 On K-148 insert the following sequence

VERB 33 ENTR
+03375 ENTR
+03375 ENTR
+03375 ENTR
On Event Module verify that ISS WARNING lamp lights in approximately 90 seconds.

6.3.7.19.2 After approximately 20 seconds, VERB 01 NOUN 10 shall be displayed. Verify that CRT DSKY display of Row 1 indicates 33XXX or 32XXX.

6.3.7.20 FDAI Linearity Test

6.3.7.20.1 On K-148 enter VERB 33 ENTR
VERB 33 NOUN 27 shall be displayed.

6.3.7.20.2 On CRT verify the following:

PITCH ATT ERROR is between +15.3 and +18.7 DEG (GG 2219)
YAW ATT ERROR is between +15.3 and +18.7 DEG (GG 2249)
ROLL ATT ERROR is between +15.3 and +18.7 DEG (GG 2279)

6.3.7.20.3 On K-148 press ENTR.
VERB 33 NOUN 30 shall be displayed.

6.3.7.20.4 On CRT verify the following:

PITCH ATT ERROR is between +14.4 and +17.6 DEG (GG 2219)
YAW ATT ERROR is between +14.4 and +17.6 DEG (GG 2249)
ROLL ATT ERROR is between +14.4 and +17.6 DEG (GG 2279)

6.3.7.20.5 On K-148 press ENTR.
VERB 33 NOUN 31 shall be displayed

6.3.7.20.6 On CRT verify the following:

PITCH ATT ERROR is between +05.4 and +06.6 DEG (GG 2219)
YAW ATT ERROR is between +05.4 and +06.6 DEG (GG 2249)
ROLL ATT ERROR is between +05.4 and +06.6 DEG (GG 2279)

6.3.7.20.7 On K-148 press ENTR.
VERB 33 NOUN 32 shall be displayed.

6.3.7.20.8 On CRT verify the following:

PITCH ATT ERROR is between +00.2 and -00.2 DEG (GG 2219)
YAW ATT ERROR is between +00.2 and -00.2 DEG (GG 2249)
ROLL ATT ERROR is between +00.2 and -00.2 DEG (GG 2279)

6.3.7.20.9 On K-148 press ENTR.
VERB 33 NOUN 33 shall be displayed.

6.3.7.20.10 On CRT verify the following:

PITCH ATT ERROR is between -05.4 and -06.6 DEG (GG 2219)
YAW ATT ERROR is between -05.4 and -06.6 DEG (GG 2249)
ROLL ATT ERROR is between -05.4 and -06.6 DEG (GG 2279)

6.3.7.20.11 On K-148 press ENTR.
VERB 33 NOUN 34 shall be displayed.

6.3.7.20.12 On CRT verify the following:

PITCH ATT ERROR is between -14.4 and -17.6 DEG (GG 2219)
YAW ATT ERROR is between -14.4 and -17.6 DEG (GG 2249)
ROLL ATT ERROR is between -14.4 and -17.6 DEG (GG 2279)

6.3.7.20.13 On K-148 press ENTR.
VERB 33 NOUN 35 shall be displayed.

6.3.7.20.14 On CRT verify the following:

PITCH ATT ERROR is between -15.3 and -18.7 DEG (GG 2219)
YAW ATT ERROR is between -15.3 and -18.7 DEG (GG 2249)
ROLL ATT ERROR is between -15.3 and -18.7 DEG (GG 2279)

6.3.7.21 On K-148 enter VERB 36 ENTR.

The proper operation of the IMU CAGE function (consisting of steps 6.3.7.21 thru 6.3.7.23) need be performed only once during the initial PGNCS Operational Test and omitted from subsequent testing of test 6.3.7.

6.3.7.21.1 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00500 ENTR
+00500 ENTR
+00500 ENTR

6.3.7.21.2 On the CRT, verify all IMU gimbal angles indicate between 003 and 007 DEG.

6.3.7.21.3 On analog recorder, monitor the following signals:

SIGNAL NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2106	IG Servo Error Total
c. GG 2166	OG Servo Error Total
d. GG 2112	IG 1X Resolver Sine
e. GG 2172	OG 1X Resolver Sine
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1% 800 cps

6.3.7.21.4 Start analog recorder to a chart speed of 5 mm/sec.

6.3.7.21.5 On LEM Cabin Panel 4, hold IMU CAGE momentary toggle switch in the ON position. (Do not release.)

6.3.7.21.6 On analog recorder, verify the 1X Resolver Sine signals (GG 2112, GG2172, GG 2142) null out to less than 0.5 VRMS. Release IMU CAGE switch to the OFF position. Disregard any momentary transients on the 1X Resolver Sine signals when the switch is released. Any sustained oscillations shall be cause for immediate removal of IMU Operate power.

6.3.7.21.7 On the CRT, verify all IMU gimbal angles indicate between 358 and 002.

6.3.7.22 Stop analog recorder.

6.3.7.22.1 On K-148 insert the following:

VERB 43	ENTR
+01700	ENTR
+00600	ENTR
-01700	ENTR

On CRT verify the following:

YAW ATT ERROR is between +15.3 and +18.7 Deg. (GG 2249).
PITCH ATT ERROR is between +05.4 and +06.6 Deg (GG 2219).
ROLL ATT ERROR is between -15.3 and -18.7 Deg. (GG 2279).

6.3.7.23 On K-148 enter the following sequence:

VERB 36		ENTR
VERB 41	NOUN 20	ENTR
+00800		ENTR
+00100		ENTR
+00800		ENTR

6.3.7.24 On CRT verify the following:

OG 1X Resolver Sin (11°) is between +06.50° and +09.50° (GG 2181)
IG 1X Resolver Sin (11°) is between -00.50 and +02.50 Deg.)GG 2121)
MG 1X Resolver Sin (11°) is between -06.50 and -09.50 Deg (GG 2151)

6.3.7.25 On K-148 enter the following:

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

6.3.8 IRIG Scale Factor Determination

6.3.8.1 Insure that the IMU operate power and LGC Operate power have been applied for a minimum of one hour and that the IMU is not in a gimbal lock condition.

6.3.8.2 On meter module monitor and record IRIG TEMP (GG2301) and PIPA TEMP (GG2300).

6.3.8.3 On K-148 enter the following sequence.

VERB 57 ENTR
00005 ENTR

6.3.8.4 PROG 06 shall be displayed.

6.3.8.5 VERB 06 NOUN 61 shall flash.

6.3.8.6 On the CRT DSKY, verify contents of Row 1 (Navigation Base Azimuth) and Row 2 (Site latitude shall be displayed).

6.3.8.7 If values for Row 1 and Row 2 are correct, proceed to the next step. If values for Row 1 and Row 2 are incorrect, enter the following sequence into K-148:

VERB 24 ENTR
±xxxxxx ENTR (Correct navigation base azimuth)
+28.516 ENTR (Correct site latitude)
Verify values in Row 1 and Row 2 are correct.

6.3.8.8 On K-148 enter the following sequence:

VERB 33 ENTR (VERB 21 NOUN 30 shall flash)
+00001 ENTR
NOTE: If PROG lamp changes from 06 to 00 during next step or PROG ALARM is on, enter VERB 36 ENTR and repeat steps 6.3.8.3 through 6.3.8.8.

6.3.8.9 In approximately 200 seconds VERB 06 NOUN 66 shall flash. Read and record from CRT DSKY Row 1 (+X IRIG Scale Factor error in part per million, Position +00001)

6.3.8.10 On K-148 enter the following sequence:

VERB 33 ENTR (VERB 21 NOUN 30 shall flash)
+00002 ENTR

NOTE: If PROG lamp changes from 05 to 00 during next step or PROG ALARM lamp is on, enter VERB 36 ENTR and repeat steps 6.3.8.3 through 6.3.8.7 and 6.3.8.10.

6.3.8.11 In approximately 200 seconds VERB 06 NOUN 66 shall flash. Read and record from CRT DSKY Row 1 (+Y IRIG Scale Factor error in parts per million Position +00002).

6.3.8.12 On K-148 enter the following sequence:

VERB 33 ENTR (VERB 21 NOUN 30 shall flash)
+00003 ENTR

NOTE: If PROG lamp changes from 05 to 00 during the next step, or PROG ALARM lamp is ON, enter VERB 36 ENTR and repeat steps 6.3.8.3 through 6.3.8.7 and 6.3.8.12.

6.3.8.13 In approximately 200 seconds VERB 06 NOUN 66 shall flash. Read and record from CRT DSKY Row 1 (+Z IRIG Scale Factor error in parts per million, Position +00003).

6.3.8.14 On K-148 enter the following sequence:

VERB 33 ENTR (VERB 21 NOUN 30 shall flash)
-00001 ENTR

NOTE: If PROG lamp changes from 05 to 00 during the next step, or PROG ALARM lamp is on, enter VERB 36 ENTR and repeat steps 6.3.8.3 through 6.3.8.7 and 6.3.8.14.

6.3.8.15 In approximately 200 seconds, VERB 06 NOUN 66 shall flash. Read and record from CRT DSKY Row (+X IRIG Scale Factor error in parts per million, Position -00001).

6.3.8.16 On K-148 enter the following sequence:

VERB 33 ENTR (VERB 21 NOUN 30 shall flash)
-00002 ENTR
NOTE: If PROG lamp changes from 05 to 00 during the next step, or PROG ALARM lamp is ON, enter VERB 36 ENTR and repeat steps 6.3.8.3 through 6.3.8.7 and 6.3.8.16.

6.3.8.17 In approximately 200 seconds, VERB 06 NOUN 66 shall flash. Read and record from CRT DSKY Row 1 (-Y IRIG Scale Factor error in parts per million, Position -00002).

6.3.8.18 On K-148 enter the following sequence:

VERB 33 ENTR (VERB 21 NOUN 30 shall flash)
-00003 ENTR
NOTE: If PROG lamp changes from 05 to 00 during the next step, or PROG ALARM is ON, enter VERB 36 ENTR and repeat steps, 6.3.8.3 through 6.3.8.7 and 6.3.8.18.

6.3.8.19 In approximately 200 seconds, VERB 06 NOUN 66 shall flash. Read and record from CRT DSKY Row 1 (+Z IRIG Scale Factor error in parts per million, Position -00003).

6.3.8.20 Repeat steps 6.3.8.8 through 6.3.8.19 twice to obtain second and third set of data.

6.3.8.21 Terminate this test by entering in K-148 the following:

VERB 34 ENTR
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.8.22 The average of the three readings of Scale Factor Error for each of the 6 positions shall be 0 ± 1750 PPM.

6.3.9 IMU performance Test. A reference data sheet is provided at the end of this section to aid in data reduction.

6.3.9.1 Insure that IMU Operate power and LGC Operate power has been applied for a minimum of one hour and that the IMU is not in a Gimbal Lock condition.

6.3.9.2 On CRT display, monitor and record IRIG TEMP (GG 2301) and PIPA TEMP (GG 2300).

6.3.9.3 Adjust oscilloscope to display butterfly of X PIPA.

6.3.9.4 On K-148 enter the following:

VERB 01 NOUN 10 ENTR
00003 ENTR
Record CRT DSKY Row 1 indication AAAAA and the time of day.

6.3.9.5 On K-148 enter the following:

VERB 21 NOUN 01 ENTR
03377 ENTR
AAAAA ENTR
VERB 06 NOUN 02 ENTR
03377 ENTR
Record CRT DSKY Row 1 indications as ±BBBBB.

6.3.9.6 Perform the following calculations:

a. $\frac{\text{BBBBB} \times 5.12}{3600}$ = CCCC.C (Contents (hrs) of high order scalar register)

b. 23.3 = CCCC.C = DDDD.D hours.

c. DDDD.D + present time of day = time of day at which high order scalar register will overflow.

6.3.9.7 If the time of day is within 12 minutes of that calculated in 6.3.9.6.c when about to perform any of the following paragraphs, wait until that time calculated in 6.3.9.6.c has passed and proceed.

Paragraph
6.3.9.15
6.3.9.22
6.3.9.30
6.3.9.36
6.3.9.43
6.3.9.48

6.3.9.8 On K-148 enter the following sequence:

VERB 01 NOUN 01 ENTR
00366 ENTR
Record contents of Row 1 XXXXY
VERB 21 NOUN 01 ENTR
00366 ENTR
XXXXY' ENTR
Where Y' is obtained from Table II.
VERB 57 ENTR
00001 ENTR
VERB 06 NOUN 61 shall flash

6.3.9.9 On the CRT, DSKY display verify R1 (Navigation Base Azimuth) and R2 (Site Latitude) are correct.

6.3.9.10 If values for R1 and R2 are correct, proceed to next step.
If values for R1 and R2 are incorrect, enter the following sequence into K-148.

VERB 24 ENTR
±xxx.xx ENTR (Correct navigation base azimuth ±0.50 deg)
+28.516 ENTR (Correct site latitude)
Verify values in R1 and R2 are correct

6.3.9.11 On K-148 enter the following sequence:

VERB 33 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.12 On CRT, DSKY display, verify R1 = +00600 (Time),
R2 = +00000 (Test Index No.) and R3 = +00001 (Test Position).
If values for R1, R2 and R3 are correct, proceed to next step.
If values for R1, R2 and R3 are incorrect, enter the following sequence into K-148:

VERB 25 ENTR
+00600 ENTR
+00000 ENTR (Test Index Number)
+00001 ENTR (Test Position Entry)

6.3.9.13 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.14 In approximately 12 minutes, VERB 06 NOUN 66 shall flash. From the CRT, DSKY display, record R2 (+NBDY Position +00001).

6.3.1.15 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.16 Deleted.

6.3.9.17 In approximately 5 minutes, VERB 06 NOUN 66 shall flash. From the CRT, record R1 and R2 (+X PIPA Position +00001). Row 1 is whole part, Row 2 is fractional part. Units are cm/sec^2.

6.3.9.18 On K-148 enter the following sequence:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.19 On CRT, DSKY display verify R1 = +00600, R2 = +00000, and R3 = +00002.

6.3.9.20 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.21 In approximately 12 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R2 (+NBDZ Position +00002).

6.3.9.22 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.23 Approximately 5 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R1 and R2 (-X PIPA Position +00002).

6.3.9.24 On K-148 enter the following sequence:

VERB 33 ENTR
Record CRT gimbal angle indications and time.

6.3.9.25 In approximately 67 minutes, VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R2 (-NBDX + ADIAX Pos +00002). Record CRT gimbal angle indications and time.

6.3.9.26 On K-148 enter the following sequence:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.27 On CRT, DSKY display, verify R1 = +00600, R2 = +00000, and R3 = +00003.

6.3.9.28 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.29 In approximately 12 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R2 (-NBDX Position +00003).

6.3.9.30 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.31 In approximately 5 minutes, VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R1 and R2 (+Z PIPA Position +00003).

6.3.9.32 On K-148 enter the following sequence:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash.

6.3.9.33 On the CRT, DSKY display verify R1 = +00600, R2 = 00000, and R3 = +00004.

6.3.9.34 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.35 In approximately 12 minutes, VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R2 (+NBDY + ADSRAY Position +00004).

6.3.9.36 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.37 Deleted.

6.3.9.38 In approximately 5 minutes, VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R1 and R2 (-Z PIPA Position +00004).

6.3.9.39 On K-148 enter the following sequence:

VERB 33 ENTR
Record CRT gimbal angle indications and time.

6.3.9.40 In approximately 67 minutes VERB 06 NOUN 66 shall flash. From the CRT DSKY display record R2 (+NBDZ + ADIAZ Position +00004). Record CRT gimbal angle indications and time.

6.3.9.41 On K-148 enter the following sequence:

VERB 33 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.42 From the CRT, DSKY display verify R1 = +00600, R2 = +00000 and R3 = +00005.

6.3.9.43 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.44 The PROG alarm and GIMBAL LOCK lamps shall light. Press Error Reset.

6.3.9.45 In approximately 5 minutes, VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R1 and R2 (+Y PIPA Position +00005).

6.3.9.46 On K-148 enter the following sequence:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.47 On the CRT, DSKY display verify R1 = +00600, R2 = +00000 and R3 = +00006.

6.3.9.48 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.49 The PROG alarm and GIMBAL LOCK lamps shall light. Press Error Reset.

6.3.9.50 In approximately 5 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R1 and R2. (-Y PIPA Position +00006).

6.3.9.51 On K-148 enter the following sequence:

VERB 34 ENTR

VERB 06 NOUN 66 shall flash

6.3.9.52 On the CRT, DSKY display, verify R1 = +00600, R2 = +00000 and R3 = +00007.

6.3.9.53 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.54 In approximately 12 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R2 (+.707 ADSRAX - NBDX Position +00007).

6.3.9.55 On K-148 enter the following sequence:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.56 On the CRT, DSKY display, verify R1 = +00600, R2 = +00000, and R3 = +00008.

6.3.9.57 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.58 In approximately 12 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display, record R2 -.707 (NBDZ+NBDY) +0.5 (ADSRAY + ADSRAZ) +0.5 (ADIAZ - ADIAY) (Position +00008).

6.3.9.59 On K-148 enter the following:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash.

6.3.9.60 On the CRT, DSKY display, verify R1 = +00600, R2 = +00000, and R3 = +00009.

6.3.9.61 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.62 In approximately 12 minutes VERB 06 NOUN 66 shall flash. From the CRT DSKY display, record R2 (-NBDZ + .707 ADSRAZ Position +00009).

6.3.9.63 On K-148 enter the following sequence:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.64 On the CRT, DSKY display, verify R1 = +00600, R2 = +00000, and R3 = +00010.

6.3.9.65 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.66 In approximately 12 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R2 [.707 (NBDY-NBDX) +.5 (ADIAY - ADIAX) +.5 ADSRAX] (Position +00010).

6.3.9.67 Terminate this test by entering in K-148 the following:

VERB 36 ENTR

6.3.9.68 On CRT, record IRIG TEMP (CG 2301) and PIPA TEMP(CG 2300).

6.3.9.69 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.9.70 Calculations,
NOTE: Use Post Vibration or System Test data points only.

6.3.9.70.1 Obtain data from last IRIG and/or PIPA test and fill in Data Sheet x_{i-1}.

6.3.9.70.2 Obtain data from second last IRIG and/or PIPA test and fill in Data Sheet x_{i-2}.

6.3.9.70.3 Obtain data from third last IRIG and/or PIPA test and fill in Data Sheet x_{i-3}.

6.3.9.70.4 Perform the following calculations for each item appearing on Data Sheet x_i and transfer all results to lines au through bi.

NOTE:

See paragraph 5.6 before continuing.

$$D_1 = \left| x_{i-1} - x_i \right|$$

$$D_2 = \left| x_{i-1} - x_i \right| + \left| x_{i-2} - x_{i-1} \right|$$

$$D_3 = \left| x_{i-3} - x_{i-2} \right| + \left| x_{i-2} - x_{i-1} \right| + \left| x_{i-1} - x_i \right|$$

DATA SHEET

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.3.9. 14	+N BDY Transfer result to line af.	meru	( ) ---.--	a
6.3.9. 17	+ X PIPA Test Position +00001	cm/sec^2	( ) 00---. ( ) -----	b
6.3.9. 21	+N BDZ Position +00002 Transfer result to line ag	meru	( ) ---.--	c
6.3.9 23	-X PIPA Test Position +00002	cm/sec^2	( ) 00---. ( ) -----	d
6.3.9. 25	-N BDX + ADIAX Position +00002	meru	( ) ---.--	e
6.3.9 29	-N BDX Position +00003 Multiply by-1 and transfer result to line ah.	meru	( ) ---.--	f
6.3.9. 31	+Z PIPA Test Position +00003	cm/sec^2	( ) 00---. ( ) -----	g
6.3.9 35	+N BDY + ADSRAY Position +00004	meru	( ) ---.--	h
6.3.9. 38	-Z PIPA Test Position +00004	cm/sec^2	( ) 00---. ( ) -----	i
6.3.9. 40	+N BDZ + ADIAZ Position +00004	meru	( ) ---.--	j
6.3.9. 45	+Y PIPA Test Position +00005	cm/sec^2	( ) 00---. ( ) -----	k
6.3.9. 50	-Y PIPA Test Position +00006	cm/sec^2	( ) 00---. ( ) -----	l
6.3.9. 54	-NBDX + .707 ADSRAX Position +00007	meru		m
6.3.9. 58	-.707 (NBDZ+NBDY) +0.5 (ADIAZ-ADIAY) +0.5 (ADSRAY+ADSRAZ) Position +00008	meru		n
6.3.9 62	-NBDZ + .707 ADSRAZ Position +00009	meru		o
6.3.9. 66	.707 (NBDY-NBDX +.5 (ADIAY-ADIAX) +.5 ADSRAX Position +00010	meru		p

DATA SHEET

CALCULATION	PARAMETER	UNITS	
line c - line f = ( ) ---.-- (-NBDX+ADIAX) - (-NBDX) Transfer result to line al.	ADIAX	meru/g	q
line h - line a = ( ) ---.-- (+NBDY+ADSRAY) - (-NBDY) Transfer result to line ai.	ADSRAY	meru/g	r
line j - line c = ( ) ---.-- (+NBDZ+ADIAZ) - (NBDZ) Transfer result to line am.	ADIAX	meru/g	s
(line m - line f) X1.414 = ( ) ---.-- (-NBDX + .707 ADSRAX) -(-NBDX) X 1.414 Transfer result to line ak.	ADSRAX	meru/g	t
(line o + line c) X1.414 = ( ) ---.-- (-NBDZ + .707 ADSRAZ + NBDZ) X 1.414 Transfer result to line aj.	ADSRAZ	meru/g	u
(line p - .707 line a - .707 line f +.5 line q -.5 line t) X2 = ---.-- [.707 (NBDY-NBDX) +.5 (ADIAY-ADIAX) +.5 ADSRAX -.707 (-NBDX) -.707 NBDY +.5 ADIAX - .5 ADSRAX] X2 Transfer result to line an.	ADIAY	meru/g	v
line b - line d = ( )	PIPA X2G	cm sec^2	w
line k - line l = ( )	PIPA Y2G	cm/sec^2	x
line g - line i = ( )	PIPA Z2G	cm/sec^2	y
1958.48 ÷ line w x 1 cm/sec pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ao.	X PIPA S. F.	cm/sec/ pulse	z
1958.48 ÷ line x X1cm/sec/pulse = Subtract 1.000000 from this value, multiply X10^6 and transfer results to line ap.	Y PIPA S. F.	cm/sec/ pulse	aa
1958.48 ÷ line y X 1 cm/sec/ pulse = Subtract 1.000000 from this value, multiply X10^6 and transfer results to line aq.	Z PIPA S. F.	cm/sec/ pulse	ab
1/2 (line b + line d) = ( ) --.--- Transfer results to line ar.	X PIPA Bias	cm/sec^2	ac
1/2 (line k + line l) = ( ) --.--- Transfer results to line as.	Y PIPA Bias	cm/sec^2	ad
1/2 (line g + line i) = ( ) --.--- Transfer results to line at.	Z PIPA Bias	cm/sec^2	ae

DATA SHEET
(x_1)

PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
NBDY	meru	-15		+15			af
NBDZ	meru	-15		+15			ag
NBDX	meru	-15		+15			ah
ADSRAY	meru/g	-40		+40			ai
ADSRAZ	meru/g	-40		+40			aj
ADSRAX	meru/g	-40		+40			ah
ADIAX	meru/g	-100		+100			al
ADIAZ	meru/g	-100		+100			am
ADIAY	meru/g	-100		+100			an
X PIPA S. F. error from line z	PPM	-1900		+1900			ao
X PIPA S. F. error from line aa	PPM	-1900		+1900			ap
Z PIPA S. F. error from line ab	PPM	-1900		+1900			aq
X PIPA Bias from line ac	cm/sec^2	-3.1		+3.1			ar
X PIPA Bias from line ad	cm/sec^2	-3.1		+3.1			as
Z PIPA Bias from line ae	cm/sec^2	-3.1		+3.1			at

DATA SHEET
(x_{i-1})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET
(x_{1-2})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET
(X4-3)

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET

PARAMETER	UNITS	D_1	MAX	D_2	MAX	D_3	MAX	
NBDY	meru		6		9		11	au
NBDZ	meru		6		9		11	av
NBDX	meru		6		9		11	aw
ADSRAY	meru/g		14		21		25	ax
ADSRAZ	meru/g		14		21		25	ay
ADSRAX	meru/g		14		21		25	az
ADIAX	meru/g		17		33		40	ba
ADIAZ	meru/g		17		33		40	bb
ADIAY	meru/g		17		33		40	bc
X PIPA S. F.	Error PPM		400		500		600	bd
Y PIPA S. F.	Error PPM		400		500		600	be
Z PIPA S. F.	Error PPM		400		500		600	bf
X PIPA Bias	cm/sec^2		0.5		0.7		0.9	bg
Y PIPA Bias	cm/sec^2		0.5		0.7		0.9	bh
Z PIPA Bias	cm/sec^2		0.5		0.7		0.9	bi

Y	Y'
0	2
1	3
2	2
3	3
4	6
5	7
6	6
7	7

TABLE II

6.3.10 LGC Voltage Margin Test

6.3.10.1 Initial Conditions

6.3.10.1.1 Insure that the G&N System is in the Standby Mode.

6.3.10.1.2 On the CRT, verify the +28 VDC LGC OPERATE bus is between 24.5 and 33.5 vdc (GG 1520).

6.3.10.2 Voltage Margin Determination

6.3.10.2.1 On the PSA Adapter Module (PSAAM) (410-31080), place INHIBIT VOLTAGE FAIL switch to ON.

CAUTION: The +4 vdc LGC Supply voltage shall never be operated lower than +2.5 vdc or higher than +5.2 vdc (GG 1030).

The +14 vdc LGC Supply shall never be operated less than +8.5 vdc or higher than +17.0 vdc (GG 1020).

NOTE: The flashing indication of the LGC supplies may be disregarded for this test. The charts in Table III may be used to determine approximate values for the "XX.X" values of C-156 voltage dial settings corresponding to various power supply voltages.

6.3.10.2.2 Enter 0001 into R155. Verify and execute.

6.3.10.2.3 Enter 1111 into R154, Verify and execute.

6.3.10.2.4 Enter in C-156 ±XX.X001114. (Enter a value for XX.X which will adjust the +14V power supply (GG 1020) as monitored on the CRT, to 12.1 (+0.1, -0.0) vdc. See Table III. Execute.

6.3.10.2.5 Enter in C-156 ±XX.X001124 (Enter a value for XX.X which will adjust the +4V power supply (GG 1030) as monitored on the CRT, to 3.4 (+0.08, -0.0) vdc. See Table III. Execute.

6.3.10.2.6 On K-148 press ERROR RESET.

6.3.10.2.7 On K-148 initiate LGC Self-Check by entering the following:

VERB 21 NOUN 27 ENTR
77767 ENTR

Wait 200 seconds. Verify RESTART lamp on the DSKY is not lit.

6.3.10.2.8 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lighted.

6.3.10.2.9 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL switch to ON. Press ERROR RESET. Perform the following DSKY operations:

VERB 21 NOUN 27 ENTR
77767 ENTR

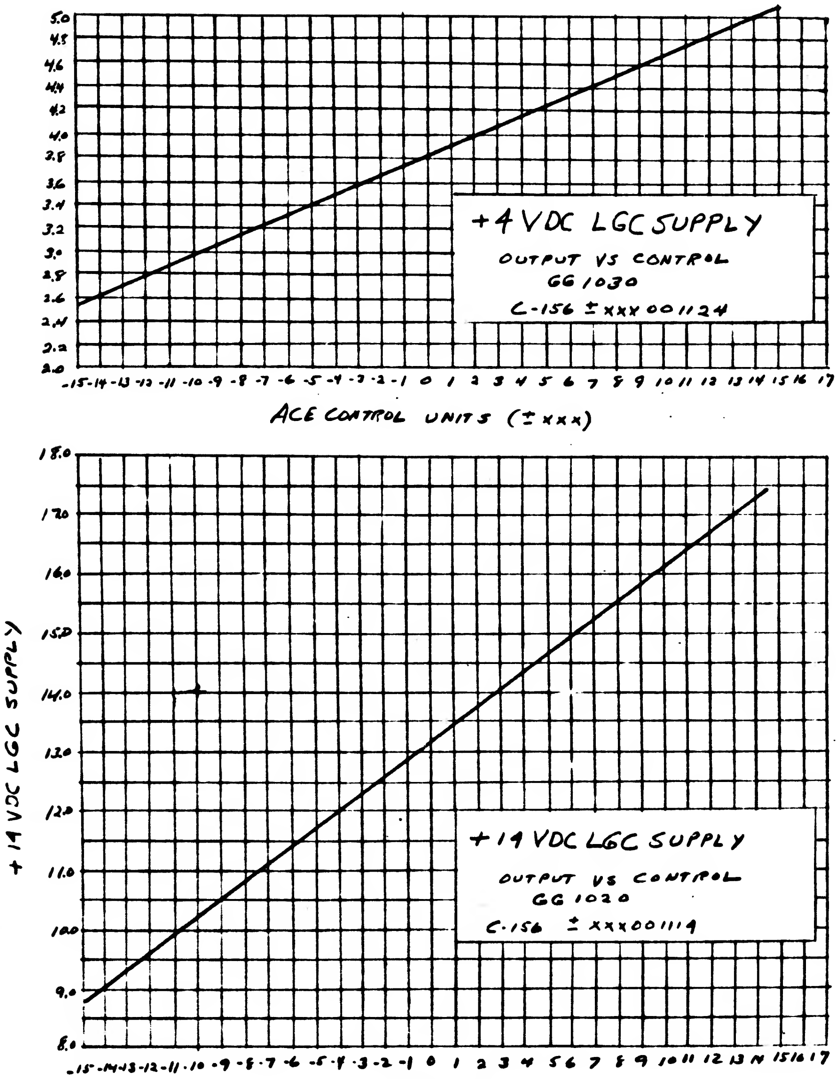

+4 VDC LGC SUPPLY
OUTPUT VS CONTROL
GG 1030
C-156 ± XXX 001124
5.0
4.8
4.6
4.4
4.2
4.0
3.8
3.6
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
ACE CONTROL UNITS (± XXX)
+14 VDC LGC SUPPLY
OUTPUT VS CONTROL
GG 1020
C-156 ± XXX00114
18.0
17.0
16.0
15.0
14.0
13.0
12.0
11.0
10.0
9.0
8.0
+14 VDC LGC SUPPLY
-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

TABLE III

6.3.10.2.10 Enter in C-156 (±) XX.X001114 (Enter a value for XX.X which will adjust the +14V power supply (GG 1020) as monitored on the CRT, to 16.4 (+0.0,-0.1) vdc. See Table III Execute.

6.3.10.2.11 On K-148 press ERROR RESET. Wait 200 seconds. Verify RESTART lamp on DSKY is not lighted.

6.3.10.2.12 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lighted. Set the INHIBIT VOLTAGE FAIL switch to ON. Press ERROR RESET. Perform the following DSKY operations.

VERB 21   NOUN 27   ENTR
77767   ENTR

6.3.10.2.13 Enter in C-156 ±XX.X001124 (Enter a value for XX.X which will adjust the 4V power supply (GG 1030) as monitored on the CRT, to 4.6 (+0.0,-0.03) vdc. See Table III. Execute.

6.3.10.2.14 On K-148 press ERROR RESET. Wait 200 seconds. Verify RESTART lamp on DSKY is not lit.

6.3.10.2.15 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL Switch to OFF. Verify RESTART lamp on the DSKY is lit. Set the INHIBIT VOLTAGE FAIL switah to ON. Press ERROR RESET. Perform the following DSKY operations:

VERB 21   NOUN 27   ENTR
77767   ENTR

6.3.10.2.16 Enter in C-156 (±) XX.X001114 (Enter a value for XX.X which will adjust the 14V power supply (GG 1020) as monitored on the CRT, to 12.2 (+0.1,-0.0) vdc. See Table III. Execute.

6.3.10.2.17 On K-148 press ERROR RESET. Wait 200 seconds. Verify RESTART lamp on DSKY is not lighted.

6.3.10.2.18 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lighted.

6.3.10.2.19 On R-154 enter 0000. Execute.

6.3.10.2.20 On R-155 enter 0000. Execute.

6.3.10.2.21 On K-148 terminate the LGC Self-Check by entering the following:

VERB 21   NOUN 27   ENTR
00000   ENTR

6.3.10.2.22 On K-148 press ERROR RESET.

6.3.11 LGC Clock Frequency Test

6.3.11.1 Insure that LGC Operate power has been applied for a minimum of 10 minutes before performing this test.

6.3.11.2 Verify that the counter is connected to the 3.2 kc signal on the hardline.

6.3.11.3 Insure that the counter has been warming up for a minimum of 30 minutes.

6.3.11.4 On the counter,

Set the FUNCTION switch to: MAN START
Set the TIME BASE switch to: 1 usec TIME UNIT/COUNT
Set the SENSITIVITY control to: CHECK

6.3.11.5 Verify proper counter operation.

6.3.11.6 Set the FUNCTION switch to REMOTE OR TIME INTERVAL.

6.3.11.7 Plug in the Preset unit and set:

MODE switch to PRESET
N switches to 96000

6.3.11.8 Turn SAMPLE RATE control fully clockwise (HOLD). Wait 35 seconds for counter display to fill.

6.3.11.9 Start counting by depressing RESET switch on counter.

6.3.11.10 After approximately 30 seconds, read and record counter display.

6.3.11.11 Repeat steps 6.3.11.9 and 6.3.11.10 nine times

6.3.11.12 The average of the 10 previous readings shall be 30.000000±0.000060 seconds.

6.3.11.13 Insure that the System is not in IMU Operate.

6.3.11.14 Perform the following DSKY operations.

VERB 21 NOUN 10 ENTR
00013 ENTR
02000 ENTR

Press and hold the STBY pushbutton on the DSKY for 3 seconds. Verify the Standby lamp is lighted.

6.3.11.15 Repeat steps 6.3.11.9 through 6.3.11.12.

6.3.11.16 Press and hold the STBY pushbutton on the DSKY for 3 seconds. Verify the Standby lamp is not lighted.

6.3.11.17 On the Computer Control and Reticle dimmer assembly, press and hold MARK X pushbutton.

6.3.11.18 On the DSKY observe

VERB 15 NOUN 50
Row 1 = 00112
Prog Alarm lamp is lighted
Press ERR RSET

6.3.11.19 Enter the following on K-148

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.20 Observe that DSKY Row 1 displays 00004.

6.3.11.21 Release MARK X pushbutton

6.3.11.22 Observe that DSKY Row 1 displays 00000.

6.3.11.23 Press and hold the MARK Y pushbutton on the Computer Control and Reticle Dimmer Assembly.

6.3.11.23.1 On the DSKY observe:

VERB 15 NOUN 50
Row 1 = 00112
Program Alarm lamp is lighted
Press ERR Reset

6.3.11.23.2 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.24 Observe that DSKY Row 1 displays 00010.

6.3.11.25 Release MARK Y pushbutton.

6.3.11.26 Observe that DSKY Row 1 displays 00000.

6.3.11.27 Press and hold the REJECT pushbutton on the Computer Control and Reticle Dimmer Assembly.

6.3.11.27.1 On the DSKY observe

VERB 15 NOUN 50
Row 1 = 00112
Prog Alarm lamp is lighted
Press ERR Reset

6.3.11.27.2 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.28 Observe that DSKY Row 1 displays 00020

6.3.11.29 Release the REJECT pushbutton.

6.3.11.30 Observe that DSKY Row 1 displays 00000.

6.3.11.31 On the DSKY perform the following operation:

VERB 36 ENTR

6.3.11.32 On panel 11 close PGNS AOT lamp circuit breaker. On the Computer Control and Reticle dimmer assembly, rotate the RETICLE BRIGHTNESS control to its minimum light intensity position. View through the AOT and verify that the reticle lamp is off.

6.3.11.33 While viewing through the AOT, slowly rotate the RETICLE BRIGHTNESS control to increase the reticle brightness until a stop is reached. Observe that the reticle brightness has increased in intensity. Return RETICLE BRIGHTNESS control to off state. On panel 11 open PGNS AOT lamp circuit breaker.

6.3.11.34 AOT eyepiece Heater Test.

6.3.11.34.1 Secure milliameter HP 428B and current probe HP428A-21A.

6.3.11.34.2 Locate P1 at Computer Control and Reticle Dimmer assembly. Push lacing cord away from P1 back to fifth tie point.

6.3.11.34.3 Clip current probe HP428A-21A to blue wire in cable with red arrow pointing away from P1. Measure and record current indication. The current shall be between 139 and 244 ma.

6.3.11.34.4 Remove current probe, push lacing cord back to P1 and spot tie.

6.3.12 Gimbal Friction Test

6.3.12.1 Inner Gimbal Friction Test

6.3.12.1.1 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.1.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00200).

6.3.12.1.3 Set up Analog Recorder to monitor the following signals:

MEAS. NO.	SIGNAL NAME
a. GG 2110	IG Torque Motor Current
b. GG 2106	IG Servo Error Total
c. GG 2107	IG Servo Error In Phase
d. GG 2112	IG 1x Resolver Sine
e. GG 2113	IG 1x Resolver Cosine
f. GG 2220	IG CDU Fine Error
g. GG 1201	IMU 28V 1% 800 CPS
h. GG 2221	IG CDU Coarse Error

6.3.12.1.4 Set up Analog Recorder to monitor the following signals:

MEAS. NO.	SIGNAL NAME
a. GG 2300	PIPA TEMP
b. GG 2301	IRIG TEMP
c. GG 1520	+28 VDC LGC OPR BUS

6.3.12.1.5 After 10 seconds has elapsed since step 6.3.12.1.1, enter the following into K-148:

VERB 21 NOUN 01 ENTR
00403 ENTR
00000 ENTR

6.3.12.1.6 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 = 00000
R3 = 00403

6.3.12.1.7 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
37777 ENTR ENTR
37743 ENTR ENTR
00000 ENTR ENTR
00000 ENTR (once)

6.2.12.1.8 Start analog recorders using a chart speed of 10 mm/sec (IG-360° TORQUE)

6.3.12.1.9 On K-148 enter the following sequence:

VERB 01 NOUN 01 ENTR
00366 ENTR
Records contents of Row 1 XXXXY
VERB 21 NOUN 01 ENTR
00366 ENTR
XXXXY' ENTR
Where Y' is obtained from Table II.
VERB 42 ENTR
VERB 33 ENTR

6.3.12.1.10 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.1.11 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 3 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.1.12 On the CRT, verify CDU X, CDU Y, CDU Z all indicate +00000 (±00200).

6.3.12.1.13 After 10 seconds has elapsed since step 6.3.12.1.11 enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
00403 ENTR
00000 ENTR

6.3.12.1.14 Verify on CRT, DSKY display.

VERB 21	NOUN 01
R1	00000
R3	00403

6.3.12.1.15 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
40000 ENTR ENTR
40034 ENTR ENTR
00000 ENTR ENTR
00000 ENTR (once)

6.3.12.1.15 (cont)

40034 ENTR ENTR
Verify R1 = 40034
00000 ENTR ENTR
Verify R1 = 00000
00000 ENTR (once)
Verify R1 = 00000

6.3.12.1.16 Start analog recorders using a chart speed of 10 mm/sec (IG +360° TORQUE)

6.3.12.1.17 On K-148 enter the following sequence

VERB 42 ENTR
VERB 33 ENTR

6.3.12.1.18 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.2 **Outer Gimbal Friction Test**

6.3.12.2.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 3 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.2.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00200).

6.3.12.2.3 Set up analog recorder to monitor the following:

MEAS NO.		SIGNAL NAME
a.	OG 2167	OG Servo Error In Phase
b.	OG 2170	OG Torque Motor Current
c.	OG 2166	OG Servo Error Total
d.	OG 2280	OG CDU Fine Error
e.	OG 2172	OG 1X Resolver Sine
f.	OG 2173	OG 1X Resolver Cosine
g.	GG 2281	OG CDU Coarse Error

6.3.12.2.4 After 10 seconds has elapsed since step 6.3.12.2.1 enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
00403 ENTR
37777 ENTR

6.3.12.2.5 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 37777
R3 00403

6.3.12.2.6 On K-148 enter the following sequence:

```
NOUN 15  ENTR
37743    ENTR    ENTR
00000    ENTR    ENTR
00000    ENTR    ENTR
00000    ENTR    ENTR
00000    ENTR    (once)
```

6.3.12.2.7 Start analog recorders using a chart speed of 10 mm/sec. (OG - 360° TORQUE)

6.3.12.2.8 On K-148 enter the following sequence:

```
VERB 42  ENTR
VERB 33  ENTR
```

6.3.12.2.9 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.2.10 On K-148 enter the following sequence:

```
VERB 40  NOUN 20  ENTR  Wait 3 seconds
VERB 41  NOUN 20  ENTR
+00000   ENTR
+00000   ENTR
+00000   ENTR
```

6.3.12.2.11 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00200).

6.3.12.2.12 After 10 seconds has elapsed since step 6.3.12.2.10, enter the following sequence into K-148.

```
VERB 21  NOUN 01  ENTR
00403    ENTR
40000    ENTR
```

6.3.12.2.13 Verify on CRT, DSKY display.

VERB 21 NOUN 01
R1 40000
R3 00403

6.3.12.2.14 On K-148 enter the following sequence:

NOUN 15 ENTR
40034 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR

6.3.12.2.15 Start analog recorders using a chart speed of 10 mm/sec (OG +360° TORQUE)

6.3.12.2.16 On K-148 enter the following sequence

VERB 42 ENTR
VERB 33 ENTR

6.3.12.2.17 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.3 Middle Gimbal Friction Test

6.3.12.3.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 3 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+06750 ENTR

6.3.12.3.2 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00200, and CDU Z = +06750±00200.

6.3.12.3.3 Set up analog recorder to monitor the following:

MEAS. NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2137	MG Servo Error In Phase
c. GG 2140	MG Torque Motor Current
d. GG 2143	MG 1X Resolver Cosine
e. GG 2250	MG CDU Fine Error
f. GG 2142	MG 1X Resolver Sine
g. GG 2251	MG CDU Coarse Error

6.3.12.3.4 After 10 seconds have elapsed since step 6.3.12.3.1, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
00403 ENTR
00000 ENTR

6.3.12.3.5 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 = 00000
R3 = 00403

6.3.12.3.6 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
14000 ENTR ENTR
00000 ENTR (once)

6.3.12.3.7 Start analog recorders using a chart speed of 10 mm/sec. (MG - 135° TORQUE)

6.3.12.3.8 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.3.9 Monitor analog recorder. When MG Torque Motor Current (GG 2140) drops to a quiescent level (approximately 6 minutes), stop the recorders.

6.3.12.3.10 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 3 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
-06750 ENTR

6.3.12.3.11 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00200, and CDU Z = -06750±00200.

6.3.12.3.12 After 10 seconds has elapsed since step 6.3.12.3.10, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
00403 ENTR
00000 ENTR

6.3.12.3.13 On the CRT, DSKY display verify:

VERB 21 NOUN 01
R1 = 00000
R3 = 00403

6.3.12.3.14 On K-148 enter the following sequence:

```
NOUN 15   ENTR
00000     ENTR   ENTR
00000     ENTR   ENTR
00000     ENTR   ENTR
63777     ENTR   ENTR
77777     ENTR   (once)
```

6.3.12.3.15 Start analog recorders using a chart speed of 10 mm/sec. (MG +135° TORQUE)

6.3.12.3.16 On K-148 enter the following sequence:

```
VERB 42   ENTR
VERB 33   ENTR
```

6.3.12.3.17 Monitor analog recorder. When the MG Torque Motor Current signal (GG 2140) drops to a quiescent level (approximately 6 minutes) stop the recorders.

6.3.12.3.18 On K-148 enter the following sequence:

```
VERB 41   NOUN 20   ENTR
+00000    ENTR
+00000    ENTR
+00000    ENTR
Wait 15 seconds
VERB 36   ENTR
```

6.3.12.4 Test Analysis

6.3.12.4.1 Remove the strip charts from analog recorders.

6.3.12.4.2 Examine each trace carefully to detect any sharp discontinuities of the traces. Disregard all transients less than 0.5 second (5 mm) on any Torque Motor Current signal. Disregard all transients less than 0.2 seconds (2 mm) on any CDU Fine Error signal.

6.3.12.4.3 No Torque Motor Current signal on (GG 2140, GG 2170, GG 2110) shall ever exceed (0.125) amp. Sensitivity on recorder is 20 ma/division for GG 2110, GG 2140 and 36 ma/division for GG 2170.

6.3.12.4.4 No CDU Fine Error on (GG 2220, GG 2280, GG 2250) shall ever exceed (.070) volts. Sensitivity on recorder is 30 mv/division.

6.3.12.4.5 No CDU Coarse Error (GG 2221, GG 2281, GG 2251) shall ever exceed .680 volts.

6.3.13 Stabilization Loop Step Response Test

6.3.13.1 IG Response Test

6.3.13.1.1 On K-148 enter the following sequence:

```
VERB 40  NOUN 20  ENTR  Wait 3 seconds
VERB 41  NOUN 20  ENTR
+00000   ENTR
+00000   ENTR
+00000  ENTR
```

6.3.13.1.2 On CRT, verify IG MG, and OG gimbal angles are between 358 and 002.

6.3.13.1.3 Set up analog recorder to monitor the following:

MEAS. NO.	SIGNAL NAME
a. GG 2110	IG Torque Motor Current
b. GG 2106	IG Servo Error Total
c. GG 2107	IG Servo Error In Phase
d. GG 2112	IG 1X Resolver Sine
e. GG 2113	IG 1X Resolver Cosine
f. GG 2220	IG CDU Fine Error
g. GG 1201	IMU 28V 1 PCT 800 CPS

6.3.13.1.4 On K-148 initiate FINE ALIGN by entering the following sequence:

```
VERB 42   ENTR
+00000    ENTR
+00000    ENTR
+00000    ENTR
```

6.3.13.1.5 On the CRT verify CDU X, CDUY Y and CDU Z indicate +00000±00200.

CAUTION: If the transients caused by the subsequent step input do not damp out within 15 seconds, remove IMU Operate Power.

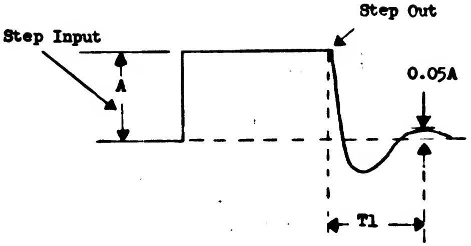
6.3.13.1.6 Enter 1000 into R-START 155.

6.3.13.1.7 Press XEQ/SEAL pushbutton on R-155 to enter the DC step voltage into the IG stabilization loop.

6.3.13.1.8 Prepare to start analog recorder at a chart speed of 100 mm/sec. (IG RESPONSE TEST).

6.3.13.1.9 Enter 0000 into R-START 155. Start analog recorder. Press the XEQ/SEAL pushbutton to remove the step input to the IG stabilization loop.

6.3.13.1.10 After the transient on the recorder has died out, stop the recorder.



TYPICAL STAB. LOOP RESPONSE TO STEP INPUT

FIGURE 3

6.3.13.1.11 From the Servo Error In Phase signal recorder trace measure the time interval (T1, Fig. 3) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 3). The period T1, shall not exeeed 0.1 second and the trace shall have no more than 3 overshoots.

6.3.13.2 MG Response Test

6.3.13.2.1 Set up analog recorder to monitor the following:

MEAS NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2137	MG Servo Error In Phase
c. GG 2140	MG Torque Motor Current
d. GG 2143	MG 1X Resolver Cosine
e. GG 2250	MG CDU Fine Error
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1% 800 cps

6.3.13.2.2 On the CRT, verify CDU X , CDU Y and CDU Z indicate +00000 (±00200).

CAUTION: If the transients caused by the subsequent step input do not die out within 15 seconds, remove IMU Operate Power.

6.3.13.2.3 Enter 0100 into R-START 155. Press XEQ/SEAL pushbutton R-155 to enter the DC step voltage into the MG stabilization loop.

6.3.13.2.4 Prepare to start analog recorder at a chart speed of 100 mm/sec. (MG RESPONSE TEST).

6.3.13.2.5 Enter 0000 into R-START 155. Start analog recorder. Press XEQ/SEAL pushbutton to remove the step input to the MG stabilization loop.

6.3.13.2.6 After the transient on the recorder has died out, stop the recorder.

6.3.13.2.7 From the Servo Error In Phase signal recorder trace measure the time interval (T1 Fig. 3) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig 3). The period, T1, shall not exeeed 0.1 seconds and the trace shall have no more than 3 overshoots.

6.3.13.3 OG Response Test

6.3.13.3.1 Set up analog recorder to monitor the following:

MEAS NO.	SIGNAL NAME
a. OG 2167	OG Servo Error In Phase
b. OG 2170	OG Torque Motor Current
c. OG 2166	OG Servo Error Total
d. OG 2280	OG CDU Fine Error
e. OG 2172	OG 1X Resolver Sine
f. OG 2173	OG 1X Resolver Cosine
g. OG 1201	IMU 28V 1ϕ 800 cps

6.3.13.3.2 On the CRT, verify CDU X, CDU Y and CDU Z indicate +00000(±00200).

CAUTION: If the transients caused by the subsequent step input do not die out within 15 seconds, remove IMU operate power.

6.3.13.3.3 Enter 0010 into R-START 155. Press XEQ/SEAL pushbutton on R-155 to enter the DC step voltage into the OG stabilization loop.

6.3.13.3.4 Prepare to start analog recorder at a chart speed of 100 mm/sec. (OG RESPONSE TEST).

6.3.13.3.5 Enter 0000 into R-155. Start analog recorder. Press XEQ/SEAL pushbutton to remove the step input to the OG stabilization loop.

6.3.13.3.6 After the transient on the recorder has died out, stop the recorder.

6.3.13.3.7 From the Servo Error In Phase signal recorder trace, measure the time interval (T1, Fig 3) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 3). The period, T1, shall not exceed 0.1 second and the trace shall have not more than 3 overshoots.

6.3.13.3.8 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.14 **G&N Fine Alignment Test**

NOTE: The Fine Alignment test results are PIPA bias corrected. It is possible for a considerable time lag to occur between PIPA bias calculations in section 6.3.9 of this specification and performance of the Fine Alignment test. The applicable portions of section 6.3.9 should be performed and the PIPA bias terms recalculated if it is deemed necessary for the proper evaluation of the Fine Alignment Test results.

6.3.14.1 On K-148 enter:

```
VERB 01  NOUN 10  ENTR
00003             ENTR
```

6.3.14.2 Record CRT, DSKY Row 1 display as AAAAA and the time of day.

6.3.14.3 On K-148 enter:

```
VERB 21  NOUN 01  ENTR
03377             ENTR
AAAAA             ENTR
VERB 06  NOUN 02  ENTR
03377    ENTR
```

6.3.14.4 Record CRT DSKY Row 1, display as ±BBBBB.

6.3.14.5 Perform the following calculations:

a. $\frac{\text{BBBBBX } 5.12}{3600}$ = CCCC.C Contents of high order scalar register in hours.

b. Calculate the times of day at which the contents of the high order scalar will be at the following times.

2.91
5.82
8.73
11.64
14.55
17.46
20.37
23.30

6.3.14.6 If the time of day is within 12 minutes of any of those times calculated in 6.3.14.5.b when about to complete step 6.3.14.30 wait until that time has passed and then proceed.

6.3.14.7 On K-148 enter:

VERB 01 NOUN 01 ENTR
00366 ENTR
Record contents of Row 1 XXXXY
VERB 21 NOUN 01 ENTR
00366 ENTR
XXXXY' ENTR
Where Y' is obtained from Table II.
VERB 57 ENTR
00003 ENTR

6.3.14.8 Verify CRT DSKY display as:

VERB 06 NOUN 61 (Flashing)
R1 = +13500 (SM Azimuth)
R2 = 28.156 (Site Latitude)

NOTE: If R1 and R2 indications are correct proceed to step 6.3.14.10.

6.3.14.9 On K-148 enter:

VERB 21 ENTR
+13500 ENTR
VERB 22 ENTR
+28516 ENTR

6.3.14.10 On K-148 enter:

VERB 33 ENTR
Observe on CRT DSKY display
VERB 21 NOUN 30 (Flashing)

6.3.14.11 On K-148 enter:

0000X ENTR (Test position, either 1 or 2)
00000 ENTR (Use AOT)
Observe on CRT DSKY display:
VERB 06 NOUN 61 (Flashing)
Disregard Row 1, 2, and 3 indications

6.3.14.12 On K-148 enter:

```
VERB 21    ENTR
+XXX.XX    ENTR (L tgt. true azimuth from 6.3.15.1.14)
VERB 22    ENTR
+XXX.XX    ENTR (L tgt. elevation from 6.3.15.1.3)
VERB 23    ENTR
00001      ENTR (L tgt. number)
VERB 33    ENTR
```

Observe on CRT DSKY display:
VERB 06 NOUN 61 (Flashing)

Disregard Row 1, 2, and 3 indications.

6.3.14.13 On K-148 enter:

```
VERB 21    ENTR
+XXX.XX    ENTR (F tgt. true azimuth from 6.3.15.1.14)
VERB 22    ENTR
+XXX.XX    ENTR (F tgt. elevation from 6.3.15.1.12)
VERB 23    ENTR
00002      ENTR (F tgt. number)
VERB 33    ENTR
```

Observe on CRT DSKY display

VERB 51 (flashing)
R1 = 00001

6.3.14.14 On Computer Control and Reticle Dimmer Assembly, press MARK X pushbutton. Observe on DSKY display:

VERB 21 NOUN 30 (Flashing)

6.3.14.15 On DSKY press ENTR.

Observe on DSKY display:

VERB 21 NOUN 43 (Flashing)

6.3.14.16 On DSKY enter:

00001 ENTR (L Detent Code)
Observe on DSKY display
VERB 21 NOUN 42 (Flashing)

6.3.14.17 Set AOT to "L" position.

6.3.14.18 Rotate AOT control knob until the center of the L tgt. reticle is superimposed between the double Y reticle. Record AOT counter value as LY XXX.XX.

6.3.14.19 Rotate AOT control knob until the center of the L tgt. reticle is superimposed between the double lines of the SPIRAL reticle. Record AOT counter value as LS XXX.XX.

6.3.14.20 On DSKY enter:

±XXX.XX ENTR (value of LY)
Observe on DSKY display:
VERB 22 NOUN 42 (Flashing)

6.3.14.21 On DSKY enter:

±XXX.XX ENTR (Value of LS)
Observe on DSKY display:
VERB 51 (Flashing)
R1 = 00002

6.3.14.22 On Computer Control and Reticle Dimmer Assembly, press MARK X pushbutton. Observe on DSKY display:

VERB 21 NOUN 30 (Flashing)

6.3.14.23 On DSKY press ENTR. Observe on DSKY display:

VERB 21 NOUN 43 (Flashing)

6.3.14.24 On DSKY enter:

00002 ENTR (F Detent Code)

Observe on DSKY display:
VERB 21 NOUN 42 (Flashing)

6.3.14.25 Set AOT to "F" position.

6.3.14.26 Rotate AOT control knob until the center of the F tgt. reticle is superimposed between the double Y reticle. Record AOT counter value as FY XXX.XX.

6.3.14.27 Rotate AOT control knob until the center of the F tgt. reticle is superimposed between the double lines of the SPIRAL reticle. Record AOT counter value as FS XXX.XX.

6.3.14.28 On DSKY enter:

±XXX.XX ENTR (value of FY)
Observe on DSKY display:
VERB 22 NOUN 42 (Flashing)

6.3.14.29 On DSKY enter:

±XXX.XX ENTR (value of FS)

NOTE: Wait until DSKY display indicates VERB 51 (Flashing) R1 = 00001 before proceeding.

NOTE: Before completing step 6.3.14.30 check time of day to verify that the high order scalar will not overflow within the next 12 minutes.

6.3.14.30 Repeat steps 6.3.14.14 through 6.3.14.29.

6.3.14.31 In approximately 7 minutes, observe on CRT DSKY display and record.

VERB 06 NOUN 66 (Flashing)
R1 = XXXXX (Whole number part of Y_{sm} misalignment about Z_{sm})
R2 = .XXXXX (Fractional number part of Y_{sm} misalignment about Z_{sm}.)

6.3.14.32 On K-148 enter.

VERB 33 ENTR
Observe on CRT DSKY display and record:
VERB 06 NOUN 66 (Flashing)

R1 = XXXXX (Whole number part of Z_{sm} misalignment about Y_{sm})
R2 = .XXXXX (Fractional number part of Z_{sm} misalignment about Y_{sm})

6.3.14.33 On K-148 enter:

VERB 36 ENTR
Press ERROR RESET

6.3.14.34 Repeat steps 6.3.14.7 through 6.3.14.30.

6.3.14.35 In approximately 7 minutes, observe on CRT DSKY display and record.

VERB 06 NOUN 66 (Flashing)
R1 = XXXXX (Whole number part of Xsm misalignment about Ysm)
R2 = .XXXXX (Fractional number part of Xsm misalignment about Ysm)

6.3.14.36 On K-148 enter:

VERB 33 ENTR
Observe on CRT DSKY display and record:
VERB 06 NOUN 66 (Flashing)
R1 = XXXXX (Whole number part of Ysm misalignment about Xsm)
R2 = .XXXXX (Fractional number part of Ysm misalignment about Xsm)

6.3.14.37 On K-148 enter:

VERB 36 ENTR
Press ERROR RESET
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.14.38 Results. The PIPA bias determined previously in the IMU Performance Test (6.3.9) must be subtracted from the resultant data of the test.

6.3.14.38.1 Y PIPA misalignment

	R1	R2
About Z axis (from 6.3.14.31) =	±XXXXX.	XXXXX sec
Less Y PIPA bis (from 6.3.9) =	-(±XXXXX.	XXXXX) sec
Y PIPA misalingment about Z axis =	-----.	----- sec

This value shall not exceed 600 sec

6.3.14.38.2 Z PIPA misalingment

	R1	R2
About Y axis (from 6.3.14.32) =	±XXXXX.	XXXXX sec
Less Z PIPA bias (from 6.3.9) =	-(±XXXXX.	XXXXX) sec
Z PIPA misalignment about Y axis =	±-----.	----- sec

This value shall not exceed 600 sec

6.3.14.38.3 Z PIPA misalignment

	R1	R2
About Y axis (from 6.3.14.35) =	±XXXXX.	XXXXX sec
Less X PIPA bias from (6.3.9) =	-(±XXXXX.	XXXXX) sec
X PIPA misalignment about Y axis =	± -----.	----- sec

This value shall not exceed 600 sec

6.3.14.38.4 Y PIPA misalignment

	R1	R2
About X axis from (6.3.14.36) =	±XXXXX.	XXXXX sec
Less Y PIPA bias (from 6.3.9) =	-(±XXXXX.	XXXXX) sec
Y PIPA misalignment about X axis =	±-----.	----- sec

This value shall not exceed 600 sec

6.3.15 **AOT Functional Accuracy Test**

NOTE: Use of a Dioptometer is required when sighting through AOT.

6.3.15.1 Determination of Detent Angle Reference.

NOTE: The included angles between targets LOS shall be known to ±10 arc seconds. The elevation of each target LOS shall be known to ±15 arc seconds.

6.3.15.1.1 Place AOT in L detent position.

NOTE: Communication between AOT and target theodolite operators is required.

6.3.15.1.2 While viewing through AOT, instruct the target L operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target L, until the target reticle appears in the lower right quadrant of the AOT field of view.

NOTE: The target theodolite base must be level when alignment is achieved.

6.3.15.1.3 Upon alignment, zero the azimuth dial and record the elevation indication of target L as ϕ_1.

6.3.15.1.4 Place AOT in R detent position.

6.3.15.1.5 While viewing through AOT, instruct the target R operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target R, until the target reticle appears in the lower left quadrant of the AOT field of view.

6.3.15.1.6 Rotate the AOT control knob clockwise until the center of the target reticle is superimposed between the double Y reticle. Read and record the target R elevation dial indication, as ϕ_3. Zero the target R azimuth dial. Record AOT dial indication as RY = XXX.XX.

6.3.15.1.7 Rotate the AOT control knob until the center of the target reticle is superimposed between the double SPIRAL lines of AOT reticle. Record AOT dial indication as RS = XXX.XX.

6.3.15.1.8 Collimate L and R targets on each other, record each target azimuth with each target LOS leveled.

Target L az = α_1, Target R as = α_3

6.3.15.1.9 Place the AOT in F detent position.

6.3.15.1.10 Move the R target theodolite to a position in front of the AOT F detent position. (The target shall now be referred to as the F target).

6.3.15.1.11 While viewing through the AOT, instruct the target F operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target reticle appears in the center of the AOT reticle.

6.3.15.1.12 Upon alignment, zero the azimuth dial and record the elevation indication of target F as ϕ_2.

6.3.15.1.13 Collimate L and F targets on each other, record each target azimuth with each target LOS leveled. Target F az $= \alpha_2$.

6.3.15.1.14 Determine the true azimuth of targets L and F with respect to the AOT. The target azimuth shall be known to within 0.5 arc degrees.

6.3.15.1.15 Rotate the F target in azimuth and elevation to the specified and recorded angles of 6.3.15.1.12.

6.3.15.1.16 Rotate the L target in azimuth and elevation to the specified and recorded angles of 6.3.15.1.13.

6.3.15.1.17 Calculate the values of the included angles between target L and F as X_1 and targets L and R as X_2.

$$X_1 = \cos^{-1} \left\{ \sin \phi_1 \sin \phi_2 + \cos \phi_1 \cos \phi_2 \cos \left[180 - (\alpha_1 + \alpha_2) \right] \right\}$$

$$X_2 = \cos^{-1} \left\{ \sin \phi_1 \sin \phi_3 + \cos \phi_1 \cos \phi_3 \cos \left[180 - (\alpha_3 + \alpha_1) \right] \right\}$$

Where: α_1 = az value, step 6.3.15.1.8

α_2 = az value, step 6.3.15.1.13

α_3 = az value, step 6.3.15.1.8

6.3.15.2 Computer Loading of Detent Calibration Data

6.3.15.2.1 On K-148 enter:

```
VERB 21   NOUN 03   ENTR
01467               ENTR
XXX.XX              ENTR  (Detent L AZ data)
                    ENTR
01470               ENTR
XXX.XX              ENTR (Detent F AZ data)
                    ENTR
01471               ENTR
XXX.XX              ENTR  (Detent R AZ data)
                    ENTR
01472               ENTR
XXX.XX              ENTR   (Detent L EL data)
                    ENTR
01473               ENTR
XXX.XX              ENTR  (Detent F EL data)
                    ENTR
```

6.3.15.2.1 (cont)

1474 ENTR
XXX.XX ENTR (Detent R EL data)

6.3.15.3 AOT Measurement of X_1

6.3.15.3.1 On K-148 enter:

VERB 57 ENTR
00012 ENTR
Observe VERB 51 flashing and R1 = 00001 on CRT DSKY display.

6.3.15.3.2 On Computer Control and Reticle Dimming Assembly press MARK X pushbutton. Observe VERB 50 displayed on CRT DSKY display.

6.3.15.3.3 On DSKY press ENTR

Observe VERB 21 NOUN 30 flashing on DSKY

6.3.15.3.4 On DSKY enter:

00000 ENTR
Observe VERB 21 NOUN 43 flashing
00001 ENTR
Observe VERB 21 NOUN 42 flashing

6.3.15.3.5 Set AOT in L detent position.

6.3.15.3.6 Rotate the AOT control knob clockwise until the center of the target reticle is superimposed between the double Y reticle. Read and record LY = XXX.XX.

6.3.15.3.7 Rotate the AOT control knob until the center of the target reticle is superimposed between the double SPIRAL lines of AOT reticle. Record AOT Dial indication as LS XXX.XX.

6.3.15.3.8 On DSKY enter:

±XXX.XX ENTR (LY from 6.3.15.3.6)
Observe VERB 22 NOUN 42 flashing
±XXX.XX ENTR (LS from 6.3.15.3.7)
Observe VERB 51 flashing and R1 = 00002.

6.3.15.3.9 On Computer Control and Reticle Dimming Assembly, press MARK X pushbutton. Observe VERB 50 displayed.

6.3.15.3.10 On DSKY press ENTR
Observe VERB 21, NOUN 30 flashing on DSKY.

6.3.15.3.11 On DSKY enter:

00000 ENTR
Observe VERB 21, NOUN 43 flashing
00002 ENTR
Observe VERB 21, NOUN 42 flashing

6.3.15.3.12 Set AOT in F detent position.

6.3.15.3.13 Rotate AOT control knob clockwise until the center of the target reticle is superimposed between the double Y reticle. Record AOT dial indication as FY = XXX.XX.

6.3.15.3.14 Rotate the AOT control knob until the center of the target reticle is superimposed between the double S reticle lines. Record AOT dial indications as FS = XXX.XX.

6.3.15.3.15 On DSKY enter:

±XXX.XX ENTR (FY from 6.3.15.3.13)
Observe VERB 22 NOUN 42 flashing
±XXX.XX ENTR (FS from 6.3.15.3.14)
Observe VERB 06 NOUN 03, R1 = X1±0.08 degrees.

6.3.15.4 AOT Measurement of X2

6.3.15.4.1 On K-148 enter

VERB 57 ENTR
00012 ENTR
Observe VERB 51 flashing and R1 = 00001 on CRT DSKY display.

6.3.15.4.2 On Computer Control and Reticle Dimming Assembly, press MARK X pushbutton. Observe VERB 50 displayed on CRT DSKY display.

6.3.15.4.3 On DSKY press ENTR. Observe VERB 21 NOUN 30 flashing on DSKY.

6.3.15.4.4 On DSKY enter:

00000 ENTR
Observe VERB 21 NOUN 43 flashing
00001 ENTR
Observe VERB 21 NOUN 42 flashing
±XXX.XX ENTR (LY from 6.3.15.3.6)
Observe VERB 22 NOUN 42 flashing
±XXX.XX ENTR (LS from 6.3.15.3.7)
Observe VERB 51 flashing and R1 = 00002.

6.3.15.4.5 On Computer Control and Reticle Dimming Assembly, press MARK X pushbutton. Observe VERB 50 displayed.

6.3.15.4.6 On DSKY press ENTR. Observe VERB 21, NOUN 30 flashing on DSKY.

6.3.15.4.7 On DSKY enter:

00000 ENTR
Observe VERB 21 NOUN 43 flashing
00002 ENTR
Observe VERB 21 NOUN 42 flashing
±XXX.XX ENTR (RY from 6.3.15.1.6)
Observe VERB 22 NOUN 42 flashing
±XXX.XX ENTR (RS from 6.3.15.1.7)
Observe VERB 06 NOUN 03, R1 = X2±0.08 degrees.

6.3.16 Flight Rope Fixed Memory Bank Sum Check

NOTE: Before proceeding with this test, obtain a Computer Program listing of the flight program being tested. Prepare a list of the bank CKSM bugger words.

6.3.16.1 Verify G&N system in Standby Mode.

6.3.16.2 On K-148 enter the following sequence:

Press ERR RST
VERB 56 ENTR
Observe VERB 05 NOUN 01 flashing

6.3.16.3 Record the CRT DSKY display indications.

Row 1 = AAAAA	Bank Sum
Row 2 = 000BB	Bank Number
Row 3 = CCCCC	(Bank CKSM bugger word)

Row 1 shall be the same as or the complement of the number displayed in Row 2. Row 3 Indication shall be the same as the bugger word recorded above for the bank tested.

6.3.16.4 On K-148 enter VERB 33 ENTR

6.3.16.5 Repeat paragraphs 6.3.16.3 and 6.3.16.4 until all memory bank sums have been checked.

6.3.16.6 On K-148 enter VERB 34 ENTR.

6.3.17 LGC Clock Alignment Test

6.3.17.1 Verify the following CRT indications:

ACCEPT UPLINK - ON
UP LOCK - OFF
OP ERROR - OFF

6.3.17.2 Set R144 to 00001 and execute observe that CRT indicates TIME ERROR as blank.

6.3.17.3 Set 70 00024 020 into C156 to insert K-FACT Execute.

6.3.17.4 Set 71 00000 000 into C156 to insert TEPOCH. Execute.

6.3.17.5 Obtain Range Time in Hours, Minutes, and Seconds.

6.3.17.6 Add 5 minutes to Range time and insert 90 XX (HRS) XX (MIN's) XXX (SEC's) into C156. Execute

6.3.17.7 Set 91 + 00000 00 into C156 to insert AGC RESET time. Execute.

6.3.17.8 Before Range Time +5 minutes occurs, set 0001 into R152. Execute.

6.3.17.9 Verify that CRT indication of TIME ERROR is blank.

NOTE: If TIME ERROR 1 is present, repeat all preceding steps of LGC Clock Alignment.

6.3.17.10 Set R152 to 0000. Execute.

6.3.17.11 Set R152 to 0010. Execute. Record CRT indication of DELTA TIME. Verify that CRT indication of TIME ERROR is blank.

6.3.17.12 Set R152 to 0000. Execute.

6.3.17.13 Set R152 to 0100. Execute. Verify that CRT indication of TIME ERROR is blank.

6.3.17.14 Set R152 to 0000. Execute.

6.3.17.15 Set R152 to 0010. Execute. Record CRT indication of DELTA TIME. DELTA TIME shall be 00(HRS), 00(MIN's) 000.000(SEC's) ±0.01 SEC.

6.3.17.16 Set R152 to 0000. Execute.

APPENDIX I

MEASUREMENT TOLERANCES

SIGNAL	SIGNAL NAME	G&N LAB TEST REQUIREMENT	PSAAM AND/OR SCA UNCERTAINTY % OF FULL SCALE
GG 1020 link 4*	+14 vdc LGC Supply	14.0±0.4 vdc	0%
GG 1030 link 4	+4 vdc LGC Supply	4.0±0.2 vdc	0%
GG 1040 link 5**	+120 vdc PIPA Supply	120±6.0 vdc	1%
GG 1070 link 4	+4 vdc CDU Supply	4.0±0.2 vdc	0%
GG 1100 link 4	-28 vdc Supply	-27.5±6.0 vdc	0%
GG 1110 link 5	2.5 vdc Telemetry Bias No. 1	2.5±0.1 vdc	0%
GG 1201 link 5	IMU 28V 800 cps 1%	28±0.56V rms	1%
GG 1202 link 4	IMU 28V 800 cps 5%	28±1.4V rms	1.5%
GG 1203 link 4	IMU 28V 800 cps 5%	28±2.1V rms	1.5%
GG 1331 link 5	3.2 kc 28V Supply 1%	28.6±0.56V rms	1%
GG 1500 link 4	+28 vdc IMU Oper BUS	28.0-3.5, +5.5 vdc	0%
GG 1510 link 4	+28 vdc IMU STBY BUS	28.0 -3.5, +5.5 vdc	0%
GG 1513X link 5	+28 vdc IMU STBY/OFF	28.0±1 vdc	0%
GG 1520 link 4	+28 vdc LGC Oper BUS	28.0 + 4.5, -3.5 vdc	0%
GG 1523X link 5	+28 vdc LGC Operate	28.0±1 vdc	0%
GG 2001 link 5	X PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
GG 2021 link 5	Y PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
GG 2041 link 5	Z PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
GG 2106 link 4	IG Servo Error Total	0.0±60 MV rms at null	1%
GG 2107 link 5	IG Servo Error IN PH	0.0±60 MV rms at null	2%
GG 2110 link 4	IG Torque Motor Current	0.5 AMP Max during any fine Align Torque	0%
GG 2110 link 5	IG Torque Motor Current	0.5 AMP Max during any fine Align Torque	1%
GG 2112 link 5	IG 1X Resolver Out-Sine	19.65±0.98V rms at 45°	2.5%
GG 2113 link 5	IG 1X Resolver Out-Cosine	19.65±0.98V rms at 45°	2.5%
GG 2121 link 5	IG 1X Resolver Out-Sine 11°	5.35±0.27V rms at 11°	2%
GG 2136 link 4	MG Servo Error Total	0.0±60 MV rms at null	1%
GG 2137 link 5	MG Servo Error IN PH	0.0±60 MV rms at null	2%
GG 2140 link 4	MG Torque Motor Current	0.5 AMP Max during any fine Align Torque	0%
GG 2140 link 5	MG Torque Motor Current	0.5 AMP Max during any fine Align Torque	1%
GG 2142 link 5	MG 1X Resolver Out-Sine	19.65±0.98V rms at 45°	2.5%
GG 2143 link 5	MG 1X Resolver Out-Cosine	19.65±0.98V rms at 45°	2.5%
GG 2151 link 5	MG 1X Resolver Out-Sine 11°	5.35±0.27V rms at 11°	2%
GG 2166 link 4	OG Servo Error Total	0.0±60 MV rms at null	1%
GG 2167 link 5	OG Servo Error IN PH	0.0±60 MV rms at null	2%
GG 2170 link 4	OG Torque Motor Current	0.9 AMP Max during any fine Align Torque	0%
GG 2170 link 5	OG Torque Motor Current	0.9 AMP Max during any fine Align Torque	1%
GG 2172 link 5	OG 1X Resolver Out-Sine	19.65±0.98V rms at 45°	2.5%
GG 2173 link 5	OG 1X Resolver Out-Cosine	19.65±0.98V rms at 45°	2.5%
GG 2181 link 5	OG 1X Resolver Out-Sine 11°	5.35±0.27V rms at 11°	2%
GG 2219 link 5	Pitch Attitude Error	5.05±0.5V rms at 17°	1%
GG 2220 link 4	IG CDU Fine Error	0.0±0.07V rms at null	1%
GG 2221 link 4	IG CDU Coarse Error	0.0±0.68V rms at null	1%

APPENDIX I (Continued)

SIGNAL	SIGNAL NAME	G&N LAB TEST REQUIREMENT	PSAAM AND/OR SCA UNCERTAINTY % OF FULL SCALE
OG 2249 link 5	YAW Attitude Error	5.05±0.5V rms at 17°	1%
OG 2250 link 4	MG CDU Fine Error	0.0±0.07V rms at null	1%
OG 2251 link 4	MG CDU Coarse Error	0.0±0.68V rms at null	1%
OG 2279 link 5	Roll Attitude Error	5.05±0.5V rms at 17°	1%
OG 2280 link 4	OG CDU Fine Error	0.0±0.07V rms at null	1%
OG 2281 link 4	OG CDU Coarse Error	0.0±0.68V rms at null	1%
OG 2300 link 5	PIPA Temperature	130.5 ± 1.5°F in Operate	1%
OG 2301 link 4	IRIG Temperature	135 ± 2.5°F in Operate	1%
OG 2301 link 5	IRIG Temperature	135 ± 2.5°F in Operate	1%
OG 2302 link 4	IMU Heater Current On	28±1 vdc	0%
OG 2303 link 4	IMU Blower Current On	28±1 vdc	0%
OG 3304 link 5	RR Shaft 1X Resolver Out-Sine	19.65±0.98V rms at 45°	2.5%
OG 3305 link 5	RR Shaft 1X Resolver Out-Cosine	19.65±0.98V rms at 45°	2.5%
OG 3311 link 4	RR Shaft CDU Fine Error	0.0±0.07V rms at null	1%
OG 3312 link 4	RR Shaft CDU Coarse Error	0.0±0.68V rms at null	1%
OG 3321 link 4	RR Trunnion CDU Fine Error	0.0±0.07V rms at null	1%
OG 3322 link 4	RR Trunnion CDU Coarse Error	0.0±0.68V rms at null	1%
OG 3324 link 5	RR Trunnion 1X Resolver Out-Sine	19.65±0.98V rms at 45°	2.5%
OG 3325 link 5	RR Trunnion 1X Resolver Out-Cosine	19.65±0.98V rms at 45°	2.5%
OG 4300 link 4	LGC Temperature	87.5±42.5°F	0%
OG 6020 link 4	PIPA Calibration Module Temperature	67.5±22.5°F	0%
OG 6020 link 5	PIPA Calibration Module Temperature	67.5±22.5°F	0%
OG 6021 link 4	PSA Temperature	85±25.0°F	0%
NG 1336 link 4	PHDIFF 3.2KC 28V/LGC SYNC	0° ±10°	3%
NG 1021 link 4	14 VDC LGC Noise RMS	0.4 VRMS Max	0%
NG 1022 link 4	14 VDC LGC Noise Peak	5 volts with rise time of 2 to 5 μsec	0%
NG 1031 link 4	4 VDC LGC Noise RMS	0.4 VRMS Max	0%
NG 1032 link 4	4 VDC LGC Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1071 link 4	4 VDC CDU Noise RMS	1.0 VRMS Max	0%
NG 1072 link 4	4 VDC CDU Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1501 link 4	28 VDC IMU Operate Noise RMS	1.0 VRMS Max	0%
NG 1502 link 4	28 VDC IMU Operate Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1511 link 4	28 VDC IMU Standby Noise RMS	1.0 VRMS Max	0%
NG 1512 link 4	28 VDC IMU Standby Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1521 link 4	28 VDC LGC Operate Noise RMS	2.0 VRMS Max	0%
NG 1522 link 4	28 VDC LGC Operate Noise Peak	5.0 volts with rise time of 2 to 50 μsec	0%

* Link 4 - PSAAM Output Signal

** Link 5 - SCA Output Signal

ADDENDUM I

LEM 1

ADDITION 1: The following procedure will be performed for LEM 1 only.

6.3.18 Gyrocompassing Test

6.3.18.1 Inertial Instrument Calibration data Load.

6.3.18.1.1 On K-148 enter:

```
VERB 21  NOUN 01          ENTR
01436                     ENTR
XXXXX   (X PIPA BIAS)     ENTR
                          ENTR
01437                     ENTR
XXXXX   (X PIPA S.F.)     ENTR
                          ENTR
01440                     ENTR
XXXXX   (Y PIPA BIAS)     ENTR
                          ENTR
01441                     ENTR
XXXXX   (Y PIPA S.F.)     ENTR
                          ENTR
01442                     ENTR
XXXXX   (Z PIPA BIAS)     ENTR
                          ENTR
01443                     ENTR
XXXXX   (Z PIPA S.F.)     ENTR
                          ENTR
01444                     ENTR
XXXXX   (NBDX)            ENTR
                          ENTR
01445                     ENTR
XXXXX   (NBDY)            ENTR
                          ENTR
01446                     ENTR
XXXXX   (NBDZ)            ENTR
                          ENTR
01447                     ENTR
XXXXX   (ADIAX)           ENTR
                          ENTR
01450                     ENTR
XXXXX   (ADIAY)           ENTR
                          ENTR
01451                     ENTR
XXXXX   (ADIZ)            ENTR
                          ENTR
01452                     ENTR
XXXXX   (ADSRAX)          ENTR

                          ENTR
```

6.3.18.1.1 (cont)

01453	ENTR
XXXXX (ADSRAY)	ENTR
	ENTR
01454	ENTR
XXXXX (ADSRAZ)	ENTR
	ENTR
2506 (ZNBAZ)	ENTR
67777	ENTR
	ENTR
02507	ENTR
77777	ENTR
	ENTR
02510 (LAT)	ENTR
02422	ENTR
	ENTR
02511	ENTR
20416	ENTR

6.3.18.2 Non-Standard Gyrocompassing Position Vector Load.

6.3.18.2.1 On K-148 enter:

VERB 21 NOUN 01	ENTR
02720	ENTR
15666	ENTR
	ENTR
02721	ENTR
17272	ENTR
	ENTR
02722	ENTR
73605	ENTR
	ENTR
02723	ENTR
56237	ENTR
	ENTR
02724	ENTR
71156	ENTR
	ENTR
02725	ENTR
54506	ENTR
	ENTR
02726	ENTR
10000	ENTR
	ENTR
02727	ENTR
00000	ENTR

6.3.18.2.1 (cont)

	ENTR
02730	ENTR
07257	ENTR
	ENTR
02731	ENTR
20033	ENTR
	ENTR
02732	ENTR
13600	ENTR
	ENTR
02733	ENTR
16506	ENTR
	ENTR
02734	ENTR
00000	ENTR
	ENTR
02735	ENTR
00000	ENTR
	ENTR
02736	ENTR
62334	ENTR
	ENTR
02737	ENTR
71216	ENTR
	ENTR
02740	ENTR
10366	ENTR
	ENTR
02741	ENTR
03117	ENTR

6.3.18.3 Gyrocompassing

6.3.18.3.1 On K-148 enter

VERB 57	ENTR
00007	ENTR

6.3.18.3.2 On K-148 enter:

VERB 33	ENTR
VERB 16 NOUN 20	ENTR

6.3.18.3.3 One hour after step 6.3.18.3.2 has been performed, read and record CRT DSKY display of Row 1, Row 2, and Row 3.

6.3.18.3.4 The Row 1 indication shall be within ±000.57 degrees of desired launch azimuth.

6.3.18.3.5 Row 2 shall indicate 000.00±000.06 degrees and Row 3 shall indicate 030.00±000.06 degrees.

6.3.18.3.6 Two hours after performing paragraph 6.3.18.3.8 record CRT DSKY display of Row 1, Row 2, and Row 3.

6.3.18.3.7 The CRT DSKY display of Row 1 shall be within ±000.06 degrees of the value recorded in 6.3.18.3.3. The CRT DSKY display of Row 2 and Row 3 shall be within ±000.03 degrees of the respective values recorded in 6.3.18.3.9.

6.3.18.3.8 On K-148 enter the following:

VERB 36		ENTR
VERB 40	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

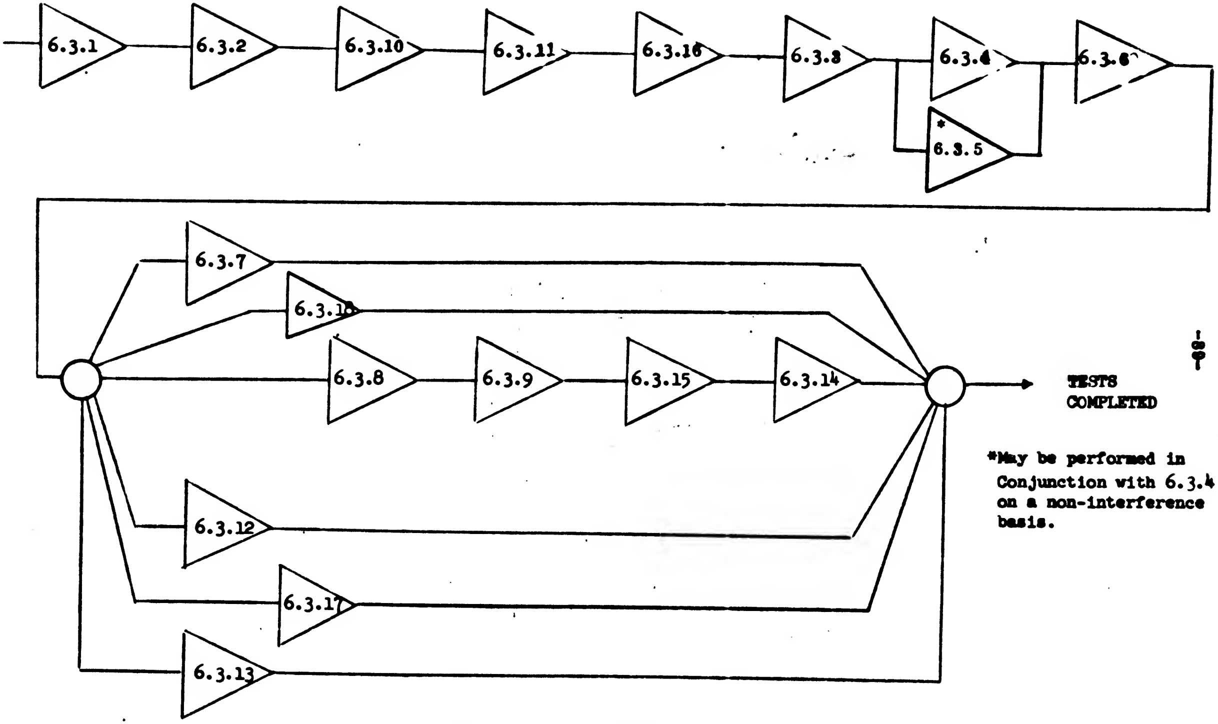
ADDENDUM 1

LEM 1

Addition 2: Perform LEM 1 test in accordance with the Following Flowgram.

Addition 3: Place a note after paragraph 6.3.1.5.2.

NOTE: Before performing the following step insure that the ATCA switch on LEM Panel 16 and the ATCA/PGNCS switch on Panel 11 are in the off position.



*May be performed in Conjunction with 6.3.4 on a non-interference basis.

TEST PROCEDURE FLOWGRAM

FIGURE 1

ADDENDUM II RR CDU TESTING

LEM 2 & Subsequent

ADDITION 1: RR CDU testing requires that the Rendezvous Radar is operating. The Rendezvous Radar is not activated until Integrated testing. To insure that the RR CDU's are operating properly the minimum requirements for RR CDU testing are presented here so that they may be included as part of the requirements to be demonstrated at the first opportunity after Rendezvous Radar activation.

6.3.19 RR/CDU Control

6.3.19.1 Command Accuracy 240.00°

6.3.19.1.1 On K-148 enter the following:

VERB 36 ENTR
VERB 41 NOUN 40 ENTR
+24000 ENTR
+24000 ENTR
VERB 34 ENTR

The CRT RR CDU Trunnion and Shaft angle indications shall be 240.00 ±000.30°.

6.3.19.2 CDU Fine and CDU Coarse Error

6.3.19.2.1 Set up analog recorder to monitor the following:

Meas No.	Signal Name
a. GG 3311	Shaft CDU Fine Error
b. GG 3312	Shaft CDU Coarse Error
c. GG 3321	Trunnion CDU Coarse Error
d. GG 3322	Trunnion CDU Coarse Error

6.3.19.2.2 On K-148 enter the following:

VERB 36 ENTR
VERB 41 NOUN 40 ENTR
+04500 ENTR
+04500 ENTR
VERB 34 ENTR

6.3.19.2.3 Verify the following signals on the CRT.

RR Shaft 1X Sine (GG 3304)	18.4±1.84 VRMS
RR Shaft 1X Cos (GG 3305)	18.4±1.84 VRMS
RR Trunnion 1X Sine (GG 3324)	18.4±1.84 VRMS
RR Trunnion 1X Cos (GG 3325)	18.4±1.84 VRMS

6.3.19.2.4 Verify that no CDU Fine Error (GG 3311, GG 3321) exceeds 0.70 volts.

6.3.19.2.5 Verify that no CDU Coarse Error (GG 3312, GG 3322) exceeds .680 volts.

6.3.19.3 RR CDU Fail

6.3.19.3.1 On K-148 enter the following:

```
VERB 36              ENTR
VERB 41    NOUN 40   ENTR
+00100               ENTR
+00000               ENTR
VERB 34              ENTR
VERB 21    NOUN 10   ENTR
00012                ENTR
00001                ENTR
```

Verify RR CDU Fail comes ON in approximately 10 seconds.

6.3.19.3.2 On K-148 enter the following:

```
Press ERR RST
VERB 36              ENTR
VERB 41    NOUN 40   ENTR
+00000               ENTR
+00100               ENTR
VERB 34              ENTR
VERB 21    NOUN 10   ENTR
00012                ENTR
00001                ENTR
```

Verify RR CDU Fail comes ON in approximately 10 seconds.

6.3.19.3.3 On K-148 enter the following:

Press ERR RST		
VERB 36		ENTR
VERB 41	NOUN 40	ENTR
+03375		ENTR
+00000		ENTR
VERB 34		ENTR
VERB 21	NOUN 10	ENTR
00012		ENTR
00001		ENTR

Verify RR CDU Fail comes ON in approximately 10 seconds.

6.3.19.3.4 On K-148 enter the following:

Press ERR RST		
VERB 36		ENTR
VERB 41	NOUN 40	ENTR
+00000		ENTR
+03375		ENTR
VERB 34		ENTR
VERB 21	NOUN 10	ENTR
00012		ENTR
00001		ENTR

Verify RR CDU Fail comes ON in approximately 10 seconds.

6.3.19.3.5 On K-148 enter the following:

Pres ERR RST		
VERB 36		ENTR
VERB 41	NOUN 40	ENTR
+00000		ENTR
+00000		ENTR
VERB 34		ENTR

ADDENDUM III

DANCE G&N System Tests

Addition 1: The following procedure replaces paragraph 6.3.7 when DANCE ropes are installed in the S/C.

6.3.7 Semi-Automatic Mode Test.

6.3.7.1 Verify K-START tape F07L002-K105XX-00 LEM Semi-Automatic Mode Test is on K-START tape reader.

6.3.7.2 E-Memory Program Load.

6.3.7.2.1 Start tape reader.

6.3.7.2.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.3.7.2.3 On K-148 enter the following:

VERB 01	NOUN 01	ENTR
01257		ENTR

Record contents of Row 1 XXXXY

VERB 21	NOUN 01	ENTR
01257		ENTR
XXXXY'		ENTR

Where Y' is obtained from Table II of section 6.3.9.

6.3.7.3 E-Bank Sum Check.

6.3.7.3.1 Start tape reader.

6.3.7.3.2 When tape reader stops verify that CRT DSKY Row 1 and Row 2 indicate the same numbers.

6.3.7.3.3 Repeat above two steps X times.

6.3.7.4 Command Accuracy 0°.

6.3.7.4.1 Start tape reader.

6.3.7.4.2 When tape stops verify that CRT DSKY Row 1 indicates +00002. Wait 15 seconds.

6.3.7.4.3 Read and record CRT IMU Gimbal angles. The indications shall be 000 ± 001 degrees.

6.3.7.4.4 Read and record CRT CDU angle indications. Indications shall be +000.00±000.30.

6.3.7.5 Command Accuracy 45°.

6.3.7.5.1 Start tape reader.

6.3.7.5.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00003. Wait 15 seconds.

6.3.7.5.3 Read and record CRT IMU Gimbal angles. The indications shall be 045 ± 001 degrees.

6.3.7.5.4 Read and record CRT CDU angle indications. Indications shall be +045.00 ± 000.30.

6.3.7.6 CDU Repeating Accuracy 45°.

6.3.7.6.1 Start tape reader.

6.3.7.6.2 Approximately 95 seconds after tape reader stops VERB 06 NOUN 02 will flash. Verify CRT DSKY Row 1 indicates +00004.

6.3.7.6.3 Start tape reader.

6.3.7.6.4 When tape reader stops read and record CRT DSKY Rows 1, 2, and 3 indications. Indications shall be between 77774 and 00003.

6.3.7.7 Command Accuracy 90°

6.3.7.7.1 Start tape reader.

6.3.7.7.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00005. Gimbal Lock lamp will be lighted. Wait 15 seconds.

6.3.7.7.3 Read and record CRT indication of IMU Gimbal angles. The indications shall be 090 ± 001 degrees.

6.3.7.7.4 Read and record CRT CDU angle indications. Indication shall be +090.00 ± 000.30.

6.3.7.8 Command Accuracy 135°.

6.3.7.8.1 Start tape reader.

6.3.7.8.2 When tape reader stops verify CRT DSKY Row 1 indicates +00006. Wait 15 seconds.

6.3.7.8.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 135 ± 001 degrees.

6.3.7.8.4 Read and record CRT CDU angle indications. Indications shall be +135.00 ± 000.30.

6.3.7.9 CDU Repeating Accuracy 135°.

6.3.7.9.1 Start tape reader.

6.3.7.9.2 When tape reader stops verify CRT DSKY Row 1 indicates +00007. Wait 10 seconds, verify Gimbal Lock lamp on DSKY is not lighted.

6.3.7.9.3 Start tape reader.

6.3.7.9.4 Approximately 95 seconds after tape reader stops VERB 06 NOUN 02 will flash. Verify CRT DSky Row 1 indicates +00008.

6.3.7.9.5 Start tape reader.

6.3.7.9.6 When tape reader stops read and record CRT DSKY Rows 1, 2, and 3 indications. Indications shall be between 77774 and 00003.

6.3.7.10 Plus Gimbal Lock Test.

6.3.7.10.1 Start tape reader.

6.3.7.10.2 When tape reader stops wait approximately 10 seconds. Verify CRT DSKY Row 1 indicates +00009. Verify Gimbal Lock lamp is lighted.

6.3.7.11 Command Accuracy 225°.

6.3.7.11.1 Start tape reader.

6.3.7.11.2 When tape reader stops verify CRT DSKY Row 1 indicates +00010. Gimbal Lock lamp will be lighted. Wait 15 seconds.

6.3.7.11.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 225 ± 001 degrees.

6.3.7.11.4 Read and record CRT CDU angle indications. Indications shall be +225.00 ± 000.30.

6.3.7.12 CDU Command Rate Test.

6.3.7.12.1 Middle Gimbal Rate Test.

6.3.7.12.1.2 When tape reader stops verify CRT DSKY Row 1 indicates +00011. Verify Gimbal Lock lamp is not lighted. Wait 25 seconds before proceeding.

6.3.7.12.1.3 Start tape reader.

6.3.7.12.1.4 Approximately 25 seconds after tape reader stops VERB 06 NOUN 02 will flash. Verify CRT DSKY Row 1 indicates +00012. Gimbal Lock lamp will be lighted.

6.3.7.12.1.5 Start tape reader.

6.3.7.12.1.6 When tape reader stops read and record CRT DSKY Row 1 indication. This is whole part of middle gimbal torque rate.

6.3.7.12.1.7 Start tape reader.

6.3.7.12.1.8 When tape reader stops read and record CRT DSKY Row 1 indications. This is fractional part of middle gimbal torque rate.

6.3.7.12.1.8.1 The middle gimbal torque rate shall be between 00012.00000 and 00016.00000.

6.3.7.12.2 Inner Gimbal Rate Test.

6.3.7.12.2.1 Start tape reader.

6.3.7.12.2.2 VERB 30 NOUN 26 will flash approximately 25 seconds after tape reader stops.

6.3.7.12.2.3 Start tape reader.

6.3.7.12.2.4 When tape reader stops read and record CRT DSKY Row 1 indication. This is whole part of inner gimbal torque rate.

6.3.7.12.2.5 Start tape reader.

6.3.7.12.2.6 When tape reader stops read and record CRT DSKY Row 1 indication. This is fractional part of inner gimbal torque rate.

6.3.7.12.2.7 The inner gimbal torque rate shall be between 00012.00000 and 00016.00000.

6.3.7.12.3 **Outer Gimbal Rate Test.**

6.3.7.12.3.1 Start tape reader.

6.3.7.12.3.2 VERB 30 NOUN 26 will flash approximately 25 seconds after tape reader stops.

6.3.7.12.3.3 Start tape reader.

6.3.7.12.3.4 When tape reader stops read and record CRT DSKY Row 1 indication. This is whole part of outer gimbal torque rate.

6.3.7.12.3.5 Start tape reader.

6.3.7.12.3.6 When tape reader stops read and record CRT DSKY Row 1 indication. This is fractional part of outer gimbal torque rate.

6.3.7.12.3.7 The outer gimbal torque rate shall be between 00012.00000 and 00016.00000.

6.3.7.13 **Command Accuracy 315°.**

6.3.7.13.1 Start tape reader.

6.3.7.13.2 When tape reader stops verify CRT DSKY Row 1 indicates +00013.

6.3.7.13.3 Read and record CRT IMU Gimbal angles. Indication shall be 315 ± 001 degrees.

6.3.7.13.4 Read and record CRT CDU angle indications. Indications shall be +315.00 ± 000.30.

6.3.7.14 **CDU Repeating Accuracy 315°.**

6.3.7.14.1 Start tape reader.

6.3.7.14.2 Approximately 95 seconds after tape reader stops VERB 06 NOUN 02 will flash. Verify CRT DSKY Row 1 indicates +00014.

6.3.7.14.3 Start tape reader.

6.3.7.14.4 When tape reader stops read and record CRT DSKY Rows 1, 2, and 3 indications. Indications shall be between 77774 and 00003.

6.3.7.15 Minus Gimbal Lock Test.

6.3.7.15.1 Start tape reader.

6.3.7.15.2 When tape reader stops verify CRT DSKY Row 1 indicates +00015. Verify Gimbal Lock lamp is lighted.

6.3.7.16 CDU Repeating Accuracy 225°.

6.3.7.16.1 Start tape reader.

6.3.7.16.2 When tape reader stops verify CRT DSKY Row 1 indicates +00016. Wait 15 secs. before continuing.

6.3.7.16.3 Start tape reader.

6.3.7.16.4 Approximately 95 seconds after tape reader stops VERB 30 NOUN 26 will flash.

6.3.7.16.5 Start tape reader.

6.3.7.16.6 When tape reader stops read and record CRT DSKY Rows 1, 2, and 3 indications. Indications shall be between 77774 and 00003.

6.3.7.17 OG CDU Fine Fail Test

6.3.7.17.1 Start Tape reader.

6.3.7.17.2 When tape reader stops verify CRT DSKY Row 1 indicates 00021 and Row 2 indicates 27XXX. The NO ATT lamp is lighted.

6.3.7.17.3 Start tape reader.

6.3.7.17.4 Approximately 45 secs after tape reader stops verify VERB/NOUN lights are flashing. ISS Warning lamp will be lighted.

6.3.7.17.5 Start tape reader.

6.3.7.17.6 When tape reader stops verify CRT DSKY Row 1 displays 00021 and Row 2 displays 33XXX. ISS Warning goes out approximately 4 seconds after tape stops.

6.3.7.18 IG CDU Fine Fail Test.

6.3.7.18.1 Start tape reader.

6.3.7.18.2 When tape reader stops verify CRT DSKY Row 1 indicates 00022 and Row 2 indicates 27XXX. The NO ATT lamp is lighted.

6.3.7.18.3 Start tape reader.

6.3.7.18.4 Approximately 45 seconds after tape reader stops verify VERB/NOUN lights are flashing. ISS Warning lamp will be lighted.

6.3.7.18.5 Start tape reader.

6.3.7.18.6 When tape reader stops verify CRT DSKY Row 1 displays 00022 and Row 2 displays 33XXX. ISS Warning goes out approximately 4 seconds after tape stops.

6.3.7.19 MG CDU Fine Fail Test.

6.3.7.19.1 Start tape reader.

6.3.7.19.2 When tape reader stops verify CRT DSKY Row 1 indicates 00023 and Row 2 indicates 27XXX. The NO ATT lamp is lighted.

6.3.7.19.3 Start tape reader.

6.3.7.19.4 Approximately 45 seconds after tape reader stops verify VERB/NOUN lights are flashing. ISS Warning lamp will be lighted.

6.3.7.19.5 Start tape reader.

6.3.7.19.6 When tape reader stops verify CRT DSKY Row 1 displays 00023 and Row 2 displays 33XXX. ISS Warning goes out approximately 4 seconds after tape stops.

6.3.7.20 OG CDU Coarse Fail Test.

6.3.7.20.1 Start tape readers.

6.3.7.20.2 When tape reader stops verify CRT DSKY Row 1 indicates 00024 and Row 2 indicates 27XXX. The NO ATT lamp is lighted.

6.3.7.20.3 Start tape reader.

6.3.7.20.4 Approximately 45 seconds after the tape reader stops verify VERB/NOUN lights are flashing. ISS Warning lamp will be lighted.

6.3.7.20.5 Start tape reader.

6.3.7.20.6 When tape reader stops verify CRT DSKY Row 1 displays 00024 and Row 2 displays 33XXX. ISS Warning goes out approximately 4 seconds after tape stops.

6.3.7.21 IG CDU Coarse Fail Test.

6.3.7.21.1 Start tape reader.

6.3.7.21.2 When tape reader stops verify CRT DSKY Row 1 indicates 00025 and Row 2 indicates 27XXX. The NO ATT lamp is lighted.

6.3.7.21.3 Start tape reader.

6.3.7.21.4 Approximately 45 seconds after the tape reader stops verify VERB/NOUN lights are flashing. ISS Warning lamp will be lighted.

6.3.7.21.5 Start tape reader.

6.3.7.21.6 When tape reader stops verify CRT DSKY Row 1 displays 00025 and Row 2 displays 33XXX. ISS Warning goes out approximately 4 seconds after tape stops.

6.3.7.22 MG CDU Coarse Fail Test.

6.3.7.22.1 Start tape reader.

6.3.7.22.2 When tape reader stops verify CRT DSKY Row 1 indicates 00026 and Row 2 indicates 27XXX. The NO ATT lamp is lighted.

6.3.7.22.3 Start tape reader.

6.3.7.22.4 Approximately 45 seconds after the tape reader stops verify VERB/NOUN lights are flashing. ISS Warning lamp will be lighted.

6.3.7.22.5 Start tape reader.

6.3.7.22.6 When tape reader stops verify CRT DSKY Row 1 displays 00026 and Row 2 displays 33XXX. ISS Warning goes out approximately 4 seconds after tape stops.

6.3.7.23 FDAI Linearity Test.

6.3.7.23.1 Start tape reader.

6.3.7.23.2 On CRT verify the following:

CRT DSKY Row 1 indicates +00385.
PITCH ATT ERROR is between +15.3 and +18.7 DEG (GG 2219)
YAW ATT ERROR is between +15.3 and +18.7 DEG (GG 2249)
ROLL ATT ERROR is between +15.3 and +18.7 DEG (GG 2279)

6.3.7.23.3 Start tape reader.

6.3.7.23.4 On CRT verify the following:

CRT DSKY Row 1 indicates +00364.
PITCH ATT ERROR is between +14.4 and +17.6 DEG (GG 2219)
YAW ATT ERROR is between +14.4 and +17.6 DEG (GG 2249)
ROLL ATT ERROR is between +14.4 and +17.6 DEG (GG 2279)

6.3.7.23.5 Start tape reader.

6.3.7.23.6 On CRT verify the following:

CRT DSKY Row 1 indicates +00136.
PITCH ATT ERROR is between +05.4 and +06.6 DEG (GG 2219)
YAW ATT ERROR is between +05.4 and +06.6 DEG (GG 2249)
ROLL ATT ERROR is between +05.4 and +06.6 DEG (GG 2279)

6.3.7.23.7 Start tape reader.

6.3.7.23.8 On CRT verify the following:

CRT DSKY Row 1 indicates +00000.
PITCH ATT ERROR is between +00.2 and -00.2 DEG (GG 2219)
YAW ATT ERROR is between +00.2 and -00.2 DEG (GG 2249)
ROLL ATT ERROR is between +00.2 and -00.2 DEG (GG 2279)

6.3.7.23.9 Start tape reader.

6.3.7.23.10 On CRT verify the following:

CRT DSKY Row 1 indicates -00136.
PITCH ATT ERROR is between -05.4 and -06.6 DEG (GG 2219)
YAW ATT ERROR is between -05.4 and -06.6 DEG (GG 2249)
ROLL ATT ERROR is between -05.4 and -06.6 DEG (GG 2279)

6.3.7.23.11 Start tape reader.

6.3.7.23.12 On CRT verify the following:

CRT DSKY Row 1 indicates -00364.
PITCH ATT ERROR is between -14.4 and -17.6 DEG (GG 2219)
YAW ATT ERROR is between -14.4 and -17.6 DEG (GG 2249)
ROLL ATT ERROR is between -14.4 and -17.6 DEG (GG 2279)

6.3.7.23.13 Start tape reader.

6.3.7.23.14 On CRT verify the following:

CRT DSKY Row 1 indicates -00385.
PITCH ATT ERROR is between -15.3 and -18.7 DEG (GG 2219)
YAW ATT ERROR is between -15.3 and -18.7 DEG (GG 2249)
ROLL ATT ERROR is between -15.3 and -18.7 DEG (GG 2279)

6.3.7.24 On K-148 enter VERB 36 ENTR

The proper operation of the IMU CAGE function (consisting of steps 6.3.7.24.1 thru 6.3.7.24.7) need be performed only once during the initial PGNCS Operational Test and omitted from subsequent testing of test 6.3.7.

6.3.7.24.1 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00500 ENTR
+00500 ENTR
+00500 ENTR

6.3.7.24.2 On the CRT, verify all IMU gimbal angles indicate between 003 and 007 deg.

6.3.7.24.3 On analog recorder, monitor the following signals:

SIGNAL NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2106	IG Servo Error Total
c. GG 2166	OG Servo Error Total
d. GG 2112	IG 1X Resolver Sine
e. GG 2172	OG 1X Resolver Sine
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1% 800 cps

6.3.7.24.4 Start analog recorder to a chart speed of 5 mm/sec.

6.3.7.24.5 On LEM Cabin Panel 4, hold IMU CAGE momentary toggle switch in the ON position. (Do not release.)

6.3.7.24.6 On analog recorder, verify the 1X Resolver Sine signals (GG 2112, GG 2172, GG 2142) null out to less than 0.5 VRMS. Release IMU CAGE switch to the OFF position. Disregard any momentary transients on the 1X Resolver Sine signals when the switch is released. Any sustained oscillations shall be cause for immediate removal of IMU Operate power.

6.3.7.24.7 On the CRT, verify all IMU gimbal angles indicate between 359 and 001.

6.3.7.25 Stop analog recorder.

6.3.7.25.1 On K-148 enter the following:

VERB 36	ENTR
VERB 43	ENTR
+01700	ENTR
+00600	ENTR
-01700	ENTR

On CRT verify the following:
YAR ATT ERROR is between +15.3 and 18.7 DEG (GG 2249)
PITCH ATT ERROR is between +05.5 and 06.6 DEG (GG 2219)
ROLL ATT ERROR is between -15.3 and -18.7 DEG)GG 2279)

6.3.7.26 On K-148 enter the following sequence:

VERB 36		ENTR
VERB 41	NOUN 20	ENTR
+00800		ENTR
+00100		ENTR
-00800		ENTR

6.3.7.27 On CRT verify the following:

IG 1X Resolver Sin (11°) is between +06.5 and +09.6 DEG (GG 2121)
MG 1X Resolver Sin (11°) is between +00.5 and +02.5 DEG (GG 2151)
OG 1X Resolver Sin (11°) is between -06.5 and -09.5 DEG (GG 2181)

6.3.7.28 On K-148 enter the following:

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

Addition 2: The following procedure replaces paragraph 6.3.9 when DANCE flight ropes are installed in the S/C.

6.3.9 IMU Performance test. A reference data sheet is provided at the end of this section to aid in data reduction.

6.3.9.1 Insure that IMU Operate power and LGC Operate power has been supplied for a minimum of one hour and that the IMU is not in a Gimbal Lock condition.

6.3.9.2 On CRT, monitor and record IRIG TEMP (GG 2301) and PIPA TEMP (GG 2300).

6.3.9.3 On K-148 enter the following:

VERB 01	NOUN 10	ENTR
00003		ENTR

Record CRT DSKY Row 1 indication AAAAA and the time of day.

6.3.9.4 On K-148 enter the following:

VERB 21	NOUN 01	ENTR
03377		ENTR
AAAAA		ENTR
VERB 06	NOUN 02	ENTR
03377		ENTR

Record CRT DSKY Row 1 indications as ±BBBBB.

6.3.9.9 Position 1 Stable Member Matrix Load.

6.3.9.9.1 Start tape reader.

6.3.9.9.2 When tape reader stops enter the following in K-148:

VERB 92 ENTR
00001 ENTR

6.3.9.9.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation base azimuth ±0.50 deg.)
+28.516 ENTR (Correct test site latitude)
Verify values in R1 and R2 are correct.

6.3.9.9.4 Enter the following on K-148:

VERB 33 ENTR

6.3.9.9.5 In approximately 12 minutes, VERB 06 NOUN 98 shall flash. From the CRT, DSKY display, record R2 [+NBDY (position +00001)] .

6.3.9.9.6 Enter the following on K-148:

VERB 33 ENTR

6.3.9.9.7 In approximately 6 minutes, VERB 06 NOUN 98 shall flash. From the CRT DSKY, record R1 and R2 [+X PIPA 1g (position +00001)] . Row 1 is whole part, Row 2 is fractional part.

6.3.9.9.8 Enter the following on K-148:

VERB 36 ENTR

6.3.9.10 Position 2 Stable Member Matrix Load.

6.3.9.10.1 Start tape reader.

6.3.9.10.2 When tape reader stops enter the following on K-148:

VERB 92 ENTR
00001 ENTR

6.3.9.5 Perform the following calculations:

a. $\frac{\text{BBBBB} \times 5.12}{3600}$ = CCCC.C (Contents (hrs) of high order scaler register)
b. 23.3 − CCCC.C = DDDD.D hours.
c. DDDD.D + present time of day = time of day at which high order scalar register will overflow.

6.3.9.6 If the time of day is within 12 minutes of that calculated in 6.3.9.5.c when about to perform any of the following paragraphs, wait until that time calculated in 6.3.9.5.c has passed and proceed.

a. 6.3.9.9.6
b. 6.3.9.10.6
c. 6.3.9.11.6
d. 6.3.9.12.6
e. 6.3.9.13.4
f. 6.3.9.14.4

6.3.9.7 On K-148 enter the following sequence:

VERB 01	NOUN 01	ENTR
01257		ENTR

Record contents of Row 1 XXXXY

VERB 21	NOUN 01	ENTR
01257		ENTR
XXXXY'		ENTR

Where Y' is obtained from Table II.

6.3.9.8 E-Memory Load.

6.3.9.8.1 Start tape reader.

6.3.9.8.2 When tape reader stops enter the following on K-148:

VERB 05	NOUN 01	ENTR
02239		ENTR

6.3.9.8.3 Verify CRT DSKY display the following:

Row 1	00033
Row 2	00000
Row 3	00000

6.3.9.10.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation azimuth ±0.5 deg)
+28.516 ENTR (Correct test site latitude)
Verify values in R1 and R2 are correct.

6.3.9.10.4 Enter the following on K-148:

VERB 33 ENTR

6.3.9.10.5 In approximately 12 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY display record R2 [+NBDZ (position +00002)].

6.3.9.10.6 Enter the following onK-148:

VERB 33 ENTR

6.3.9.10.7 In approximately 6 minutes, VERB 06 NOUN 98 shall flash. From the CRT DSKY record R1 and R2 [-X PIPA 1g (Position +00002)]. Row 1 is whole part, Row 2 is fractional part.

6.3.9.10.8 Enter the following on K-148:

VERB 33 ENTR

6.3.9.10.9 In approximately 67 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY record R2 [-NBDX + ADIAX (position +00002)] .

6.3.9.10.10 Enter the following on K-148:

VERB 36 ENTR

6.3.9.11 Position 3 Stable Member Matrix Load.

6.3.9.11.1 Start tape reader.

6.3.9.11.2 When tape reader stops enter the following on K-148:

VERB 92 ENTR
00001 ENTR

6.3.9.11.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation base azimuth ±0.5 deg.)
+28.516 ENTR (Correct test site latitude)
Verify values in R1 and R2 are correct.

6.3.9.11.4 Enter the following on K-148:

VERB 33 ENTR

6.3.9.11.5 In approximately 12 minutes, VERB 06 NOUN 98 shall flash. From the CRT, DSKY display, record R2 [-NBDX (position 3)] .

6.3.9.11.6 Enter the following on K-148:

VERB 33 ENTR

6.3.9.11.7 In approximately 6 minutes, VERB 06 NOUN 98 shall flash. From the CRT DSKY, record R1 and R2 [+Z PIPA 1g (position +00003)]. Row 1 is whole part, Row 2 is fractional part.

6.3.9.11.8 Enter the following on K-148:

VERB 36 ENTR

6.3.9.12 Position 4 Stable Member Matrix Load.

6.3.9.12.1 Start tape reader.

6.3.9.12.2 When tape reader stops enter the following on K-148:

VERB 92 ENTR
00001 ENTR

6.3.9.12.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation azimuth ±0.5 deg.)
+28.516 ENTR (Correct test site latitude)
Verify values in R1 and R2 are correct.

6.3.9.12.4 Enter the following on K-148:

VERB 33 ENTR

6.3.9.12.5 In approximately 12 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY, record R2 [+NBDY + ADSRAY (position +00004)] .

6.3.9.12.6 Enter the following on K-148:

VERB 33 ENTR

6.3.9.12.7 In approximately 6 minutes, VERB 06 NOUN 98 shall flash. From the CRT DSKY record R1 and R2 [-Z PIPA 1g (position +00004)]. Row 1 is whole part, Row 2 is fractional part.

6.3.9.12.8 Enter the following on K-148:

VERB 33 ENTR

6.3.9.12.9 In approximately 67 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY record R2 [+NBDZ + ADIAZ (position +00004)].

6.3.9.12.10 Enter the following on K-148:

VERB 36 ENTR

6.3.9.13 Position 5 Stable Member Matrix load.

6.3.9.13.1 Start tape reader.

6.3.9.13.2 When tape reader stops enter the following on K-148:

VERB 92 ENTR
00001 ENTR

6.3.9.13.3 Observe VERB 21 NOUN 01 flashing on K-148 enter the following:

+XXX.XX ENTR (Correct navigation azimuth ±0.5 deg.)
+28.516 ENTR (Correct test site latitude)
Verify values in R1 and R2 are correct.

6.3.9.13.4 Enter the following on K-148:

VERB 33 ENTR

6.3.9.13.5 The PROG alarm and GIMBAL LOCK lamps shall light. Press Error Reset.

6.3.9.13.6 In approximately 5 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY record R1 and R2 [+Y PIPA (position +00005)].

6.3.9.13.7 Enter the following on K-148:

VERB 36 ENTR

6.3.9.14 Position 6 Stable Member Matrix Load.

6.3.9.14.1 Start tape reader.

6.3.9.14.2 When tape reader stops enter the following on K-148:

VERB 92	ENTR
00001	ENTR

6.3.9.14.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation azimuth ±0.5 deg.)
+28.516 ENTR (Correct test site latitude)
Verify values in R1 and R2 are correct.

6.3.9.14.4 Enter the following on K-148:

VERB 33	ENTR

6.3.9.14.5 The PROG alarm and GIMBAL LOCK lamps shall light. Press Error Reset.

6.3.9.14.6 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. From the CRT DSKY record R1 and R2 [-Y PIPA (position +00005)].

6.3.9.14.7 Enter the following on K-148:

VERB 36	ENTR

6.3.9.15 Position 7 Stable Member Matrix Load.

6.3.9.15.1 Start tape reader.

6.3.9.15.2 When tape reader stops enter the following on K-148:

VERB 92	ENTR
00001	ENTR

6.3.9.15.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation azimuth ±0.5 deg.)
+28.516 ENTR (Correct test site latitude)
Verify values in R1 and R2 are correct.

6.3.9.15.4 Enter the following on K-148:

VERB 33	ENTR

6.3.9.15.5 In approximately 12 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY record R2 [+.707 ADSRAX - NBDX (position +00007)].

6.3.9.15.6 On K-148 enter the following:

VERB 36 ENTR

6.3.9.16 Position 8 Stable Member Matrix Load.

6.3.9.16.1 Start tape reader.

6.3.9.16.2 When tape reader stops enter the following on K-148:

VERB 92 ENTR
00001 ENTR

6.3.9.16.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation azimuth ±0.5 deg.)
+28.516 ENTR (Correct test site latitude)
Verify values in R1 and R2 are correct.

6.3.9.16.4 Enter the following on K-148:

VERB 33 ENTR

6.3.9.16.5 In approximately 12 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY record R2 [-.707 (NBDZ + NBDY) +0.5 (ADSRAY + ADSRAZ) +0.5 (ADIAZ - ADIAY) (position 8)].

6.3.9.16.6 On K-148 enter the following:

VERB 36 ENTR

6.3.9.17 Position 9 Stable Member Matrix Load.

6.3.9.17.1 Start tape reader.

6.3.9.17.2 When tape reader stops enter the following on K-148:

VERB 92 ENTR
00001 ENTR

6.3.9.17.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation azimuth ±0.5 deg.)
+28.516 ENTR (Correct test site latitude)
Verify values in R1 and R2 are correct.

6.3.9.17.4 Enter the following on K-148:

VERB 33 ENTR

6.3.9.17.5 In approximately 12 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY record R2 [-NBDZ + .707 ADSRAZ (position +00009)].

6.3.9.17.6 On K-148 enter the following:

VERB 36 ENTR

6.3.9.18 Position 10 Stable Member Matrix Load.

6.3.9.18.1 Start tape reader.

6.3.9.18.2 When tape reader stops enter the following on K-148:

VERB 92 ENTR
00001 ENTR

6.3.9.18.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation azimuth ±0.5 deg.)
+28.516 ENTR (Correct test site latitude)
Verify values in R1 and R2 are correct.

6.3.9.18.4 Enter the following on K-148:

VERB 33 ENTR

6.3.9.18.5 In approximately 12 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY record R2 [.707 (NBDY - NBDX) +.5 (ADIAY - ADIAX) +.5 ADSRAX (position +00010)].

6.3.9.18.6 On K-148 enter the following:

VERB 36 ENTR

Addition 3: The following procedure replaces paragraph 6.3.8 when DANCE flight ropes are installed in the S/C.

6.3.8 IRIG Scale Factor Test.

Test will be run with E-Memory program. Program to be put on K-START tape. Procedure to be supplied when available.

Addition 4: Delete section 6.3.14 Fine Alignment Test.

Addition 5: The following procedure replaces paragraph 6.3.6 when DANCE ropes are installed in the S/C.

NOTE: Manual DSKY entries during this test may result in a test abort.

6.3.6 IMU Operational Test.

6.3.6.1 Verify K-START tape F07L002-K105XX-00 LM G/N OPCHK is on K-START tape reader.

6.3.6.2 E-Memory Program Load.

6.3.6.2.1 Start tape reader.

6.3.6.2.2 When tape reader stops verify that CRT DSKY Row 1 and Row 2 indicate the same numbers.

6.3.6.2.3 Repeat above two steps X times.

6.3.6.3 Local g measurement.

6.3.6.3.1 Start tape reader.

6.3.6.3.2 In approximately 15 minutes VERB 06 NOUN 66 shall flash.

6.3.6.3.3 From the CRT DSKY display read and record Row 1 and Row 2 (local gravity whole and fractional respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.3.6.4 Horizontal earth rate measurement.

6.3.6.4.1 Start tape reader.

6.3.6.4.2 VERB 06 NOUN 66 shall flash.

6.3.6.4.3 From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y, and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.3.6.5 Enter the following on K-148:

VERB 36		ENTR
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

Addition 6: The following procedure should be used when DANCE flight ropes are installed in the S/C.

6.3.12 Gimbal Friction Test.

6.3.12.1 Inner Gimbal Friction Test.

6.3.12.1.1 On K-148 enter the following sequences:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.1.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00200).

6.3.12.1.3 Set up Analog Recorder to monitor the following signals:

MEASUREMENT NO.	SIGNAL NAME
a. GG 2110	IG Torque Motor Current
b. GG 2106	IG Servo Error Total
c. GG 2107	IG Servo Error in Phase
d. GG 2112	IG 1x Resolver Sine
e. GG 2113	IG 1x Resolver Cosine
f. GG 2220	IG CDU Fine Error
g. GG 1201	IMU 28V 1% 800 CPS
h. GG 2221	IG CDU Coarse Error

6.3.12.1.4 Set up Analog Recorder to monitor the following signals:

MEASUREMENT NO.	SIGNAL NAME
a. GG 2300	PIPA TEMP
b. GG 2301	IRIG TEMP
c. GG 1520	+28 VDC LGC OPR BUS

6.3.12.1.5 After 10 seconds has elapsed since step 6.3.12.1.1, enter the following into K-148:

```
VERB 21     NOUN 01     ENTR
02500                   ENTR
00000                   ENTR
```

6.3.12.1.6 Verify on CRT, DSKY display:

```
VERB 21     NOUN 01
R1 = 00000
R3 = 02500
```

6.3.12.1.7 On K-148 enter the following sequence:

```
NOUN 15     ENTR
00000       ENTR        ENTR
37777       ENTR        ENTR
37743       ENTR        ENTR
00000       ENTR        ENTR
00000       ENTR (once)
```

6.3.12.1.8 Start analog recorders using a chart speed of 10 mm/sec. (IG-360° TORQUE)

6.3.12.1.9 On K-148 enter the following sequences:

```
VERB 01     NOUN 01     ENTR
01273                   ENTR
Records contents of Row 1 XXXXY
VERB 21     NOUN 01     ENTR
01273                   ENTR
XXXXY'                  ENTR
Where Y' is obtained from Table II of section 6.3.9.
VERB 42                 ENTR
VERB 33                 ENTR
```

6.3.12.1.10 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.1.11 On K-148 enter the following sequence:

VERB 40	NOUN 20	ENTR	Wait 3 seconds
VERB 41	NOUN 20	ENTR	
+00000		ENTR	
+00000		ENTR	
+00000		ENTR	

6.3.12.1.12 On the CRT, verify CDU X, CDU Y, CDU Z all indicate +000.00 (±002.00).

6.3.12.1.13 After 10 seconds has elapsed since step 6.3.12.1.11 enter the following sequence into K-148:

VERB 21	NOUN 01	ENTR
02500		ENTR
00000		ENTR

6.3.12.1.14 Verify on CRT, DSKY display:

VERB 21	NOUN 01
R1	00000
R3	02500

6.3.12.1.15 On K-148 enter the following sequence:

NOUN 15	ENTR	
00000	ENTR	ENTR
40000	ENTR	ENTR
40034	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	(once)

6.3.12.1.16 Start analog recorders using a chart speed of 10 mm/sec (IG +360° TORQUE).

6.3.12.1.17 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.1.18 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.2 Outer Gimbal Friction Test.

6.3.12.2.1 On K-148 enter the following sequence:

VERB 40	NOUN 20	ENTR	Wait 3 seconds
VERB 41	NOUN 20	ENTR	
+00000		ENTR	
+00000		ENTR	
+00000		ENTR	

6.3.12.2.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +000.00 (±002.00).

6.3.12.2.3 Set up analog recorder to monitor the following:

MEASUREMENT NO.	SIGNAL NAME
a. GG 2167	OG Servo Error In Phase
b. GG 2170	OG Torque Motor Current
c. GG 2166	OG Servo Error Total
d. GG 2280	OG CDU Fine Error
e. GG 2172	OG 1X Resolver Sine
f. GG 2173	OG 1X Resolver Cosine
g. GG 2281	OG CDU Coarse Error

6.3.12.2.4 After 10 seconds has elapsed since step 6.3.12.2.1 enter the following:

VERB 21	NOUN 01	ENTR
02500		ENTR
37777		ENTR

6.3.12.2.5 Verify on CRT, DSKY display:

VERB 21	NOUN 01
R1	37777
R3	02500

6.3.12.2.6 On K-148 enter the following sequence:

NOUN 15	ENTR	
37743	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	(once)

6.3.12.2.7 Start analog recorders using a chart speed of 10 mm/sec. (OG -360° TORQUE)

6.3.12.2.8 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.2.9 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.2.10 On K-148 enter the following sequence:

VERB 40	NOUN 20	ENTR	Wait 3 seconds
VERB 41	NOUN 20	ENTR	
+00000	ENTR		
+00000	ENTR		
+00000	ENTR		

6.3.12.2.11 On the CRT, verify CDU X, CDU Y, CDU Z indicates +000.00 (±002.00).

6.3.12.2.12 After 10 seconds has elapsed since step 6.3.12.2.10, enter the following sequence into K-148:

VERB 21	NOUN 01	ENTR
02500	ENTR	
40000	ENTR	

6.3.12.2.13 Verify on CRT, DSKY display:

VERB 21	NOUN 01
R1	40000
R3	02500

6.3.12.2.14 On K-148 enter the following sequence:

NOUN 15	ENTR	
40034	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	(once)

6.3.12.2.15 Start analog recorders using a chart speed of 10 mm/sec (OG +360° TORQUE).

6.3.12.2.16 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.2.17 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.3 Middle Gimbal Friction Test.

6.3.12.3.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 3 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+06750 ENTR

6.3.12.3.2 On the CRT, verify CDU X = +000.00±002.00, CDU Y = +000.00±002.00, and CDU Z = +067.50±002.00.

6.3.12.3.3 Set up analog recorder to monitor the following:

MEASUREMENT NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2137	MG Servo Error In Phase
c. GG 2150	MG Torque Motor Current
d. GG 2143	MG 1X Resolver Cosine
e. GG 2250	MG CDU Fine Error
f. GG 2142	MG 1X Resolver Sine
g. GG 2251	MG CDU Coarse Error

6.3.12.3.4 After 10 seconds have elapsed since step 6.3.12.3.1, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02500 ENTR
00000 ENTR

6.3.12.3.5 Verify on CRT, DSKY display:

VERB 21 NOUN 01
R1 = 00000
R3 = 02500

6.3.12.3.6 On K-148 enter the following sequence:

NOUN 15	ENTR	
00000	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	ENTR
14000	ENTR	ENTR
00000	ENTR	(once)

6.3.12.3.7 Start analog recorders using a chart speed of 10 mm/sec. (MG -135° TORQUE)

6.3.12.3.8 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.3.9 Monitor analog recorder. When MG Torque Motor Current (GG 2140) drops to a quiescent level (approximately 6 minutes), stop the recorders.

6.3.12.3.10 On K-148 enter the following sequence:

VERB 40	NOUN 20	ENTR	Wait 3 seconds
VERB 41	NOUN 20	ENTR	
+00000	ENTR		
+00000	ENTR		
-06750	ENTR		

6.3.12.3.11 On the CRT, verify CDU X = +000.00±002.00, CDU Y = +000.00±002.00, and CDU Z = -067.50±002.00.

6.3.12.3.12 After 10 seconds has elapsed since step 6.3.12.3.10, enter the following sequence into K-148:

VERB 21	NOUN 01	ENTR
02500	ENTR	
00000	ENTR	

6.3.12.3.13 On the CRT, DSKY display verify:

VERB 21	NOUN 01
R1 =	00000
R3 =	02500

6.3.12.3.14 On K-148 enter the following sequence:

NOUN 15	ENTR	
00000	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	ENTR
63777	ENTR	ENTR
77777	ENTR	(once)

6.3.12.3.15 Start analog recorders using a chart speed of 10 mm/sec. (MG +135° TORQUE)

6.3.12.3.16 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.3.17 Monitor analog recorder. When the MG Torque Motor Current signal (GG 2140) drops to a quiescent level (approximately 6 minutes) stop the recorders.

6.3.12.3.18 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 36 ENTR

6.3.12.4 Test Analysis

6.3.12.4.1 Remove the strip charts from analog recorders.

6.3.12.4.2 Examine each trace carefully to detect any sharp discontinuities of the traces. Disregard all transients less than 0.5 second (5 mm) on any Torque Motor Current signal. Disregard all transients less than 0.2 second (2 mm) on any CDU Fine Error signal.

6.3.12.4.3 No Torque Motor Current signal on (GG 2140, GG 2170, GG 2110) shall exceed (0.125) amp. Sensitivity on recorder is 20 ma/division for GG 2110, GG 2140 and 36 ma/division for GG 2170.

6.3.14.4.4 No CDU Fine Error on (GG 2220, GG 2280, GG 2250) shall ever exceed (.070) volts. Sensitivity on recorder is 30 mv/division.

6.3.12.4.5 CDU Coarse Error (GG 2221, GG 2281, GG 2251) shall not exceed .680 volts.

Addition 7: Replace section 6.2.4 with the following procedure when DANCE flight ropes are installed in the S/C.

6.2.4 General Turn-On Procedure.

6.2.4.1 This step shall be effective only after having completed the initial turn-on procedures.

6.2.4.2 Proper coolant flow shall be verified.

6.2.4.3 Depress +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11 to supply IMU STANDBY power. Record Time.

6.2.4.4 Depress +28 VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11 to supply LGC Operate Power. The Restart lamp may come on; if it does press RSET on the DSKY.

6.2.4.6 On K-148 enter the following sequence:

Press ERROR RESET

VERB 36	ENTR (fresh start)
VERB 57	ENTR
00015	ENTR

6.2.4.7 On the CRT, verify that the 3.2KC 28V Supply indicates between 28.04 and 29.16 VRMS (GG 1331).

6.2.4.8 CAUTION: LGC OPERATE and IMU STANDBY power must have been applied a minimum of two hours before energizing the IMU OPERATE circuit breaker in step 6.2.4.14 unless all of the following conditions are met:

IF:

1. The G&N System has previously been in Standby Mode at least two hours and subsequently been in Operate Mode, AND
2. The gimbals were placed in a parked position prior to shutdown, AND
3. The shutdown period did not exceed 5 days, AND
4. The Spacecraft or IMU have not been moved in any way during the shutdown period.

THEN: The two-hour Standby Mode operation requirement is reduced to 15 minutes.

6.2.4.9 The G&N System is defined as being in Standby Mode when LGC Operate and IMU Standby power is applied and IMU Operate power is off. The inertial components shall have suspension power in Standby Mode.

6.2.4.10 The G&N System is defined as being in Operate Mode when LGC OPERATE, IMU STANDBY and IMU OPERATE POWER is applied to the System.

6.2.4.11 Set up analog recorder to monitor the following signals:

SIGNAL NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2106	IG Servo Error Total
c. GG 2166	OG Servo Error Total
d. GG 2112	IG 1X Resolver Sine
e. GG 2172	OG 1X Resolver Sine
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1% 800 CPS

6.2.4.12 Start the analog recorder at a chart speed of 5 mm/sec. Start the event recorder at a chart speed of 1. mm/sec.

6.2.4.13 On CRT, monitor +120 VDC PIPA SUPPLY (GG 1040) and IMU Gimbal angles. Record time. If 15 minutes have elapsed since performing paragraph 6.2.4.3 proceed to the next paragraph.

6.2.4.14 Press in +28VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11. Record time.

6.2.4.15 Verify on the analog recorder that the oscillations of the resolver sine signals (GG 2112, GG 2172, and GG 2142) are not sustained and that the signals damp out within 15 seconds. If this condition is not attained, remove IMU OPERATE power immediately.

6.2.4.16 On the CRT, verify absence of +120 VDC PIPA SUPPLY voltage for 90 ± 10 seconds after step 6.2.4.14 is initiated. Verify that this voltage is between 114 and 126 after 100 seconds from step 6.2.4.14.

6.2.4.17 Verify absence of LGC WARNING, ISS WARNING, and PGNCS CAUTION lights in the LEM cabin.

6.2.4.18 On the CRT, verify all IMU Gimbal angles between 358 and 002.

6.2.4.19 On K-148 enter the following sequence:

VERB 41	NOUN 20	ENTR
+00000	ENTR	
+00000	ENTR	
+00000	ENTR	

6.2.4.20 On the CRT, scan the power supply voltages to verify their normal operation. (No indications flashing.)

6.2.4.21 After all the tests of 6.3 in Figure 1 have been completed, the General Turn-On Procedure (6.2.4) and IMU Operational Test (6.3.6) shall be completed before re-running any test. Otherwise the testing sequence shall continue in accordance with Figure 2.

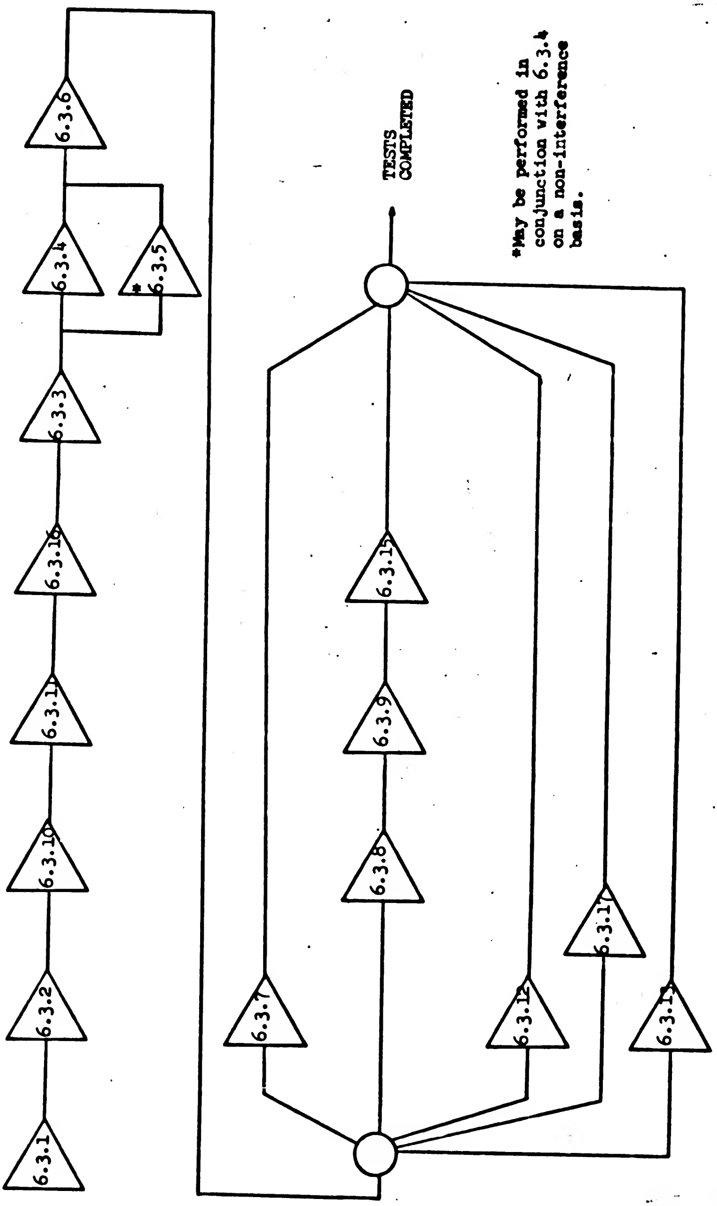
Addition 8: Replace Figures 1 and 2 with the following Figures 1 and 2 when DANCE flight ropes are installed in the S/C.

See Attachment

TABLE I RETEST SEQUENCE

Paragraph Number	Test Title	LGC	IMU	PSA	CDU	PTA	DSKY	A HARNESS	B HARNESS	Computer Control & Reticle Dimmer	Nav Base	Alignment Optical Telescope	Signal Conditioner
6.3.1	Standby Power On Test	X	X	X			X	X	X		X		
6.3.2	Alarms and Interrupts Test	X					X	X					
6.3.3	IMU Operate Power on Test		X	X	X	X		X	X		X		X
6.3.4	Temperature Control Verification		X	X				X	X		X		X
6.3.5	PGNCS Power Supply Test			X	X	X		X	X		X		X
6.3.6	IMU Operational Test	X	X	X	X	X		X	X		X		
6.3.7	PGNCS Operational Test		X	X	X			X	X		X		X
6.3.8	IRIG Scale Factor Test		X	X		X		X	X		X		
6.3.9	IMU Performance Test		X	X		X		X	X		X		
6.3.10	LGC Voltage Margin Test	X						X					
6.3.11	LGC Clock Frequency Test	X						X		X			
6.3.12	Gimbal Friction Test		X	X				X	X		X		X
6.3.13	Stabilization Loop Response Test		X	X		X		X	X		X		
6.3.15	AOT Functional Performance Test											X	
6.3.16	Flight Rope Fixed Memory Bank Sum Check	X						X					
6.3.17	LGC Clock Alignment Test	X						X					
6.2.1	Emergency Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.2	Normal Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.3	Initial Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.4	General Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*

* To be used as necessary to turn system on or off.



*May be performed in conjunction with 6.3.4 on a non-interference basis.

TEST PROCEDURE FLOWGRAM
FIGURE 2

Addition 9: Delete the following sections or paragraphs when DANCE flight ropes are installed in the S/C.

a. Paragraphs 6.3.1.5.1.1 and 6.3.1.5.1.2.
b. Section 6.3.1.5.5
c. Delete "NOTE" after 6.3.3.

Addition 10: Add new paragraph 5.6.1.3 when DANCE flight ropes are installed in the S/C.

5.6.1.3 The DANCE program does not automatically display computer error codes when a PROG alarm occurs. If error code is desired enter the following on K-148:

VERB 05 NOUN 09 ENTR

Error code will appear in R1.
Address if failure +1 appears in R2.
Number of fails appears in R3.

Addition 11: Substitute this paragraph for paragraph 6.2.2.4.1 when DANCE flight ropes are installed in the S/C.

6.2.2.4.1 On K-148 enter the following:

VERB 21	NOUN 01	ENTR
00760		ENTR
00000		ENTR

Verify that NO ATT and GIMBAL LOCK lamp indications are OFF.

APOLLO G&N Specification
ND 1002349 REV E
Original Issue Date:
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Class A Release

POST INSTALLATION CHECKOUT SPECIFICATION FOR LM G&N SYSTEM (KSC)

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approval
3/31/67	A	33482	2, 3, 5-75; was 75 pages, now 83 pages.	MGM EA
6/30/67	B	34079	1, 2, 6-18, 20-88; Was 83 pages now 86 pages.	EA
8/24/67	C	34437	19	EA
10/12/67	D	34840	3, 5-86; was 86 pages, now 128 pages.	EA
1/22/68	E	35471	2, 3, 5, 6, 8-10, 12-15, 17-22, 24, 26-28, 30-35,	EA
			41, 42, 44, 45-128; was 128 pages, now 132	
			pages.	

This specification consists of page 1 to 132 inclusive.

APPROVALS	NOT REQUIRED CCA497-C274 NASA/MSC				ACI

1. INTRODUCTION

1.1 The individual Spacecraft (SC) installed Guidance and Navigation (G&N) System to be checked out per the process specification shall consist of one of each of the following major assemblies. Refer to drawing 6015000 for specific system dash numbers and effectivities.

Assembly Name	Part Number
1 - Apollo Guidance Computer Group	6003001-XXX
1 - Inertial Meas. Unit & Pulse Torque Assembly	6007001-XXX
1 - Coupling Data Unit	2007222-XXX
1 - Power and Servo Assembly	6007200-XXX
1 - Computer Control & Reticle Dimmer Assembly	6014512-XXX
1 - G&N Interconnect Harness Assembly (LEM)	6014515-XXX
1 - Signal Conditioner Assembly	6070010-XXX
1 - Navigation Base Assembly (LEM)	6899950-XXX
1 - Alignment Optical Telescope (LEM)	6011000-XXX

1.2 The G&N System herein shall be identified by Part #6015000. The computer contains the **BURST 120 program flight ropes in the core rope memory.**

2. SCOPE

2.1 This specification outlines the checkout requirements for G&N System installed in a LEM **Vehicle. Addendum to this specification will cover any** special checkout requirements associated with individual vehicles, G&N Systems **and Computer Flight Programs.**

3. APPLICABLE DOCUMENTS

3.1

Document Number	Subject
LIS-540-10001	LEM-PGNS Functional Interface
LID-340-10000	ICD-PGNS (LGC-CDU-PSA and Sig. Cond.) Instl.
LID-340-10010	ICD-LEM DSKY Installation
LID-280-10004	ICD-IMU-AOT-NVB-PTA Installation
LID-390-10001	ICD-LEM Wiring Electrical Interface for PGNS
LID-540-10001	ICD-LEM-PGNS Functional Interface Flow Diagram

[illegible]

5.6.1.2 Failure to be within the maximum values of D_1, D_2, and D_3 after the retest sequence of 5.6.1.1 shall constitute a failure of the assembly.

5.6.2 Failure of the G&N System to pass any examination or test specified herein shall tentatively classify the G&N system as non-conforming. Normal test sequence may be continued upon determination of the cause of the nonconformance or at the discretion of the G&N contractor test team if it is determined that such action is not detrimental to the G&N System or other interfacing subsystems. All nonconformances shall be investigated and cleared by waivers (F.N.N), correction of specification, or hardware replacement and retest. The suspected malfunctioned hardware shall be removed and returned to the laboratory where the malfunction shall be verified. Only after malfunction verification shall a flight certified replaceable element be installed in the G&N System.

5.7 Retest subsequent to replacement of a malfunctioned assembly with that of a flight certified assembly shall be at the discretion of NASA Engineering. Table I can be used as a guide to determine general retest requirements. In all retest procedure, the test sequence of Figure 2 shall be adhered to. [illegible]

5.8 It is assumed that the Test Conductor has a working knowledge of the test equipment used; therefore, this procedure contains only the steps pertaining directly to the G&N components. If any questions arise concerning the test equipment, the Test Conductor should refer to the respective operational manuals.

5.9 Spacecraft systems other than the G&N System may be operating on a noninterfering basis while individual system checkout of the G&N is being conducted.

5.10 Data Retrival

5.10.1 All data concerning the checkout and operation of the G&N System as monitored via ACE, shall be recorded on the data sheets associated with their corresponding test. Out of tolerance readings shall be recorded and flagged by appropriate signals.

5.10.2 During G&N System testing, all interleaved data, Uplink Command File and Downlink Data File shall be maintained (recorders ON). All A/B PCM data, that is not made available to the ACE displays shall be verified by requesting a time history data strip out of said data for the time period when the test was performed.

5.11 General Operating Characteristics

5.11.1 The DSKY "NO ATT" lamp illuminates any time the system is in the Coarse Align Mode.

G.&N. PARAMETERS	1 → 9	PARAGRAPH NUMBERS 6.3.3.X where X is listed below
NBDX	X	[illegible]
NBDY	X	[illegible]
NBDZ	X	[illegible]
ADSRAX	X	[illegible]
ADSRAY	X	[illegible]
ADSRAZ	X	[illegible]
ADIAX	X	[illegible]
ADIAY	X	[illegible]
ADIAZ	X	[illegible]
X PIPA BIAS & S.F. ERROR	X	[illegible]
Y PIPA BIAS & S.F. ERROR	X	[illegible]
Z PIPA BIAS & S.F. ERROR	X	[illegible]

TABLE 6

A - Wait until SIGNAL LOCK lamp goes out before performing this step.

B - On K-148 enter the following

V25 ENTR
[illegible] ENTR
[illegible] ENTR
+0000X ENTR Where X is test position number represented in DSKY Row 3 display

C - When VERB 06 NOUN 06 flashes do not record test results.

TABLE 5

O.O.S PARAMETER	PERFORM POSITIONS	PARAMETERS TO BE REQUALIFIED
NBDY	1	NBDY
NBDZ	2	NBDZ
NBDX	3	NBDX
ADSRAY	1 and 4	ADSRAY, NBDY
ADSRAZ	2 and 9	ADSRAZ, NBDZ
ADSRAX	3 and 7	ADSRAX, NBDX
ADIAY	1 thru 3, 7 and 10	NBDY, NBDX, ADIAX, ADSRAX, ADIAY,
ADIAZ	2 thru 4	NBDZ, NBDX, ADIAZ
ADIAX	1 thru 3	NBDX, ADIAX, NBDY,
X PIPA Bias or S. F.	1 thru 2	X PIPA BIAS, X PIPA S. F.
Y PIPA Bias or S. F.	5 and 6	Y PIPA BIAS Y PIPA S. F.
Z PIPA Bias or S. F.	3 and 4	Z PIPA Bias, Z PIPA S. F.

TABLE I RETEST SEQUENCE

Paragraph Number	Test Title	LGC	IMU	PSA	CDU	PTA	DSKY	A HARNESS	B HARNESS	Computer Control & Reticle Dimmer	Nav Base	Alignment Optical Telescope	Signal Conditioner
6.3.1	Standby Power On Test	X	X	X			X	X	X		X		
6.3.2	Alarms and Interrupts Test	X					X	X					
6.3.3	IMU Operate Power On Test		X	X	X	X		X	X		X		X
6.3.4	Temperature Control Verification		X	X				X	X		X		X
6.3.5.	PGNCS Power Supply Test			X	X	X		X	X		X		X
6.3.6	IMU Operational Test	X	X	X	X	X		X	X		X		
6.3.7	PGNCS Operational Test		X	X	X			X	X		X		X
6.3.8	IRIG Scale Factor Test		X	X		X		X	X		X		
6.3.9	IMU Performance Test		X	X		X		X	X		X		
6.3.10	LGC Voltage Margin Test	X						X					
6.3.11	LGC Clock Frequency Test	X						X		X			
6.3.12	Gimbal Friction Test		X	X				X	X		X		X
6.3.13	Stabilization Loop Response Test		X	X		X		X	X		X		
6.3.15	AOT Functional Performance Test											X	
6.3.16	Flight Rope Fixed Memory Bank Sum Check	X						X					
6.3.17	LGC Clock Alignment Test	X						X					
6.2.1	Emergency Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.2	Normal Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.3	Initial Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.4	General Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*

* To be used as necessary to turn system on or off.

6.2.1 Emergency Shutdown Procedure

CAUTION

In the event of any malfunction which might damage the G&N System before the normal shutdown procedure in 6.2.2 can be performed, power shall be removed from the G&N System as soon as possible. If at all possible, without creating any delay, IMU Operate Power should be removed first.

6.2.2 Normal Shutdown Procedure

6.2.2.1 The normal shutdown of a G&N System shall include parking the gimbals prior to removing IMU Operate Power. This is accomplished in the following procedure.

6.2.2.2 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+09000 ENTR

6.2.2.3 On the CRT, verify the following platform angles are displayed:

IG is between 358 and 002
MG is between 088 and 092
OG is between 358 and 002
Verify Gimbal Lock Lamp is lighted.

6.2.2.4 Pull out +28 VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11 to remove IMU OPERATE power.

6.2.2.4.1 On K-148 enter the following:

VERB 21 NOUN 01 ENTR
00034 ENTR
00000 ENTR
Verify GIMBAL LOCK light and the PGNS CAUTION light OFF.
VERB 21 NOUN 01 ENTR
00326 ENTR
40000 ENTR
Verify NO ATT OFF

6.2.2.5 Pull out +28 VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11 to remove LGC OPERATE power.

6.2.2.6 Pull out +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11 to remove IMU STANDBY power.

6.2.3 Initial Turn-On Procedure

6.2.3.1 Deleted.

6.2.3.2 The initial power turn-on sequence shall be in the order specified in the test procedures (6.3) observing all cautions and delays as specified.

6.2.4 General Turn-On Procedure

6.2.4.1 This step shall be effective only after having completed the initial turn-on procedures.

6.2.4.2 Proper coolant flow shall be verified.

6.2.4.3 Depress +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11 to supply IMU STANDBY power. Record time.

6.2.4.4 Depress +28 VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11 to supply LGC Operate Power. The Restart lamp may come on; if it does press RSET on the DSKY.

6.2.4.6 If the COMP ACTY lamp on the DSKY is not lit enter the following on K-148. If it is lit proceed to the next step.

VERB 21	NOUN 01	ENTR
00377		ENTR (SMRTFLG)
37777		ENTR

Verify COMP ACTY lamp is lit.

6.2.4.8 On K-148 enter the following sequence:

Press ERROR RESET

VERB 36		ENTR
VERB 21	NOUN 27	ENTR
77777		ENTR (LGC Self Check)

6.2.4.9 Verify that PROG caution lamp does not come on for the next 5 minutes.

6.2.4.10 **CAUTION:** LGC OPERATE and IMU STANDBY power must have been applied a minimum of two hours before energizing the IMU OPERATE circuit breaker in step 6.2.4.16 unless all of the following conditions are met:

IF:
1. The G&N System has previously been in Standby Mode at least two hours and subsequently been in Operate Mode, AND
2. The gimbals were placed in a parked position prior to shutdown, AND
3. The shutdown period did not exceed 5 days, AND
4. The Spacecraft or IMU have not been moved in any way during the shutdown period.

THEN: The two-hour Standby Mode operation requirement is reduced to 15 minutes.

6.2.4.11 The G&N System is defined as being in Standby Mode when LGC Operate and IMU Standby power is applied and IMU Operate power is off. The inertial components shall have suspension power in Standby Mode.

6.2.4.12 The G&N System is defined as being in Operate Mode when LGC OPERATE, IMU STANDBY and IMU OPERATE POWER is applied to the system.

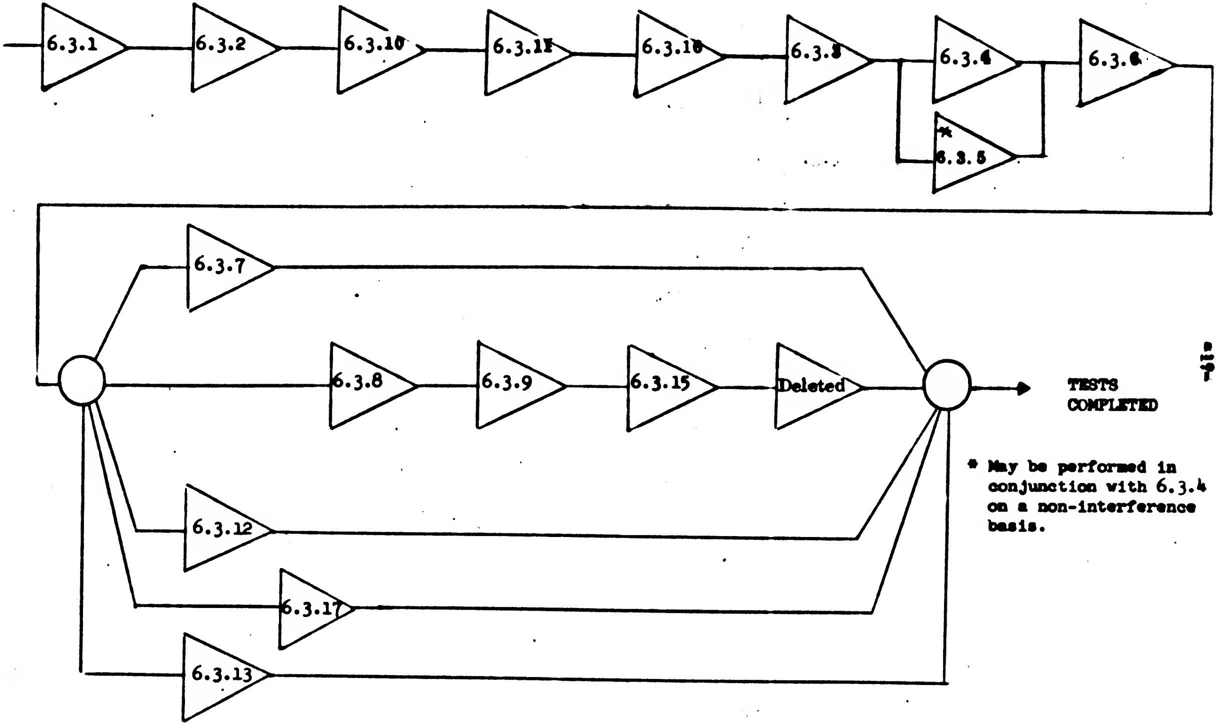
6.2.4.13 Set up analog recorder to monitor the following signals:

Signal No.		Signal Name
a.	GG 2136	MG Servo Error Total
b.	GG 2106	IG Servo Error Total
c.	GG 2166	OG Servo Error Total
d.	GG 2112	IG 1X Resolver Sine
e.	GG 2172	OG 1X Resolver Sine
f.	GG 2142	MG 1X Resolver Sine
g.	GG 1201	IMU 28V 1φ 800 CPS

6.2.4.14 Deleted.

6.2.4.15 On CRT, monitor +120 VDC PIPA SUPPLY (GG 1040) and IMU Gimbal angles. Record time. If 15 minutes have elapsed since performing paragraph 6.2.4.3 proceed to the next paragraph.

6.2.4.16 Press in +28VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11. Record time.



* May be performed in conjunction with 6.3.4 on a non-interference basis.

TEST PROCEDURE FLOWGRAM

FIGURE 2

6.2.6 A warmup period of at least one hour in Operate Mode is required prior to performing any test in which gyro or accelerometer parameters are measured, and at least 15 minutes prior to any test in which precision amplitude and frequency power supply checks are made.

6.3 Test Procedures

6.3.1 Standby Power On Tests

6.3.1.1 The Portable Temperature Controller, Model No. 400-31058 shall be supplying inertial component heater power to the G&N System through connector 56J1 (P230). If alarm or fail indications are present on the PTC, they shall be cleared by depressing the SYSTEM RESET push-button on the PTC.

6.3.1.2 The following switches and/or circuit breakers shall be closed to energize the indicated buses. On Panel 5 rotate ANUN/NUM dimmer to minimum discernable brightness. On Panel 5 set the LIGHTING OVERRIDE switch to OFF.

LOCATION	NOMENCLATURE	IDENTIFICATION
Panel 14	BAT 5 NORMAL FEED	4S10
Panel 14	BAT 6 NORMAL FEED	4S11
Panel 16	X LUNAR BUS TIE	4CB5
Panel 16	BAT 1-4-6 FEED TIE	4CB17
Panel 16	BAT 2-3-5 FEED TIE	4CB25
Panel 16	ASC ECA	4CB14
Panel 16	ASC ECA CONT.	5CB7
Panel 16	DC BUS VOLT	4CB21
Panel 16	DISP.	4CB16
Panel 11	X LUNAR BUS TIE	4CB4
Panel 11	BAT 1-4-6 FEED TIE	4CB18
Panel 11	BAT 2-3-5 FEED TIE	4CB26
Panel 11	ASC ECA	4CB15
Panel 11	ASC ECA CONT.	4CB6
Panel 11	DC BUS VOLT	4CB22
Panel 16	INV. NO. 2	4CB13
Panel 14	AC PWR to INV 2 Position	4S14
Panel 11	AC BUS FEED TIE	4CB24
Panel 11	AC BUS VOLT	4CB27
Panel 11	LTG ANUN/DOCK COMP	4CB146
Panel 16	LTG ANUN/DOCK COMP	4CB148

6.3.1.3 IMU Standby Power Turn On

6.3.1.3.1 Deleted.

6.3.1.3.2 Press in +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11. Record time.

6.3.1.3.3 Verify on the Event Recorder that +28 VDC IMU STANDBY power discrete (GG 1513) is on. On CRT +28V IMU STANDBY Bus (GG 1510) shall indicate between 24.5 and 33.5

6.3.1.3.4 The PIPA TEMP, displayed on CRT, shall be monitored periodically one hour to ensure that the PIPA Temperature Control circuitry is operating to maintain a temperature of 130±5.0 Deg. F. (GG 2300). One hour after performing step 6.3.1.3.2 record PIPA TEMP. The PIPA Temperature shall be 130.5° ±1.5° F. The IRIG temperature shall be within 3.0° F of the PIPA Temperature.

6.3.1.4 Computer Power Turn On

6.3.1.4.1 Press in +28VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11. Restart light may be on, verify LGC Warning OFF and PGNS CAUTION ON.

6.3.1.4.2 On CRT, +28V LGC Operate Bus (GG 1520) shall indicate between 23.5 and 32.5. Verify on event recorder that +28V LGC OP (GG 1523X) discrete is on. Using DSKY, enter VERB 36 ENTR then press RSET. All computer alarms shall clear.

6.3.1.4.3 On CRT, the +14VDC LGC SUPPLY (GG 1020) shall indicate between 13.6 and 14.4 VDC. Record this value.

6.3.1.4.4 On CRT the 28V 3200 CPS SUPPLY (GG 1331) shall indicate between a 28.04 and 29.16 VRMS. Record this value.

6.3.1.5 LGC Operational Tests

6.3.1.5.1 DSKY Check

6.3.1.5.1.1 Enter the following in K-148:

Press Error Reset
VERB 21 NOUN 01 ENTR
00377 ENTR (SMRTFLG)
37777 ENTR
Verify COMP ACTY lamp is lit
VERB 21 NOUN 27 ENTR
00011 ENTR

6.3.1.5.1.2 All the electroluminescent elements (PROG, VERB, NOUN and Row 1, Row 2, Row 3) shall display the decimal number nine (9). Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0/s
k. Minus signs in ROW 1, ROW 2, ROW 3
l. VERB-NOUN Flashing
m. COMP ACTY

On concurrently for 5 seconds (k., l., m.)

o. Plus signs in ROW 1, ROW 2, ROW 3
p. VERB-NOUN Flashing
q. COMP ACTY

On concurrently for 5 seconds

6.3.1.5.1.3 The DSKY pushbuttons shall be checked by entering:
VERB 25 NOUN 01 ENTR
03375 ENTR
+00123 ENTR
-00456 ENTR
-00789 DO NOT press ENTR

The DSKY shall display +00123 in Row 1, -00456, in Row 2, and -00789 in Row 3. Press CLR pushbutton three times on DSKY. Observe that Row 1, Row 2 and Row 3 are blank.

6.3.1.5.2 Lamp Test

6.3.1.5.2.1 Initiate the Lamp Test by entering in the DSKY:
VERB 35 ENTR

6.3.1.5.2.2 The following DSKY displays shall illuminate for approximately 5 seconds.

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in Row 1 Row 2 and 3.

On currently for approximately 5 seconds.

On CAUTION/WARNING panel, the following displays shall illuminate, then extinguish.
LGC
ISS
PGNS
8's remain in the VERB NOUN display.
+8's remain in DSKY row 1, 2 and 3 display

6.3.1.5.3 Uplink Check

6.3.1.5.3.1 On K-START 148, set LOAD/INHIBIT switch to LOAD, set TAPE/KEY switch to KEY, then enter the following:

ERROR RESET
VERB 25 NOUN 01 ENTR
03375 ENTR
+01234 ENTR
-56789 ENTR
+00000 ENTR

6.3.1.5.3.2 Verify the following is displayed on the DSKY

VERB 23	NOUN 01
R1 + 01234	
R2 - 56789	
R3 + 00000	

6.3.1.5.4 Downlink Check

6.3.1.5.4.1 On CRT, DSKY display verify the following is displayed:

VERB 23	NOUN 01
R1 + 01234	
R2 - 56789	
R3 + 00000	

6.3.1.5.5 LGC Self-Check

6.3.1.5.5.1 On K-148 enter the following sequence to initiate the LGC Self-Check:

VERB 36	ENTR	
VERB 21	NOUN 27	ENTR
77777		ENTR
VERB 15	NOUN 01	ENTR
01366		ENTR

6.3.1.5.5.2 On the CRT verify that DSKY R1 does not display 01102. If a malfunction occurs, the following is displayed:

R1 01102
R2 FAIL REG+1
R3 FAIL REG +2

6.3.1.5.5.3 When R2 = 00002, stop the LGC Self Check by entering the following in K-148:

VERB 34		ENTR
VERB 21	Noun 27	ENTR
00000		ENTR

6.3.1.5.6 LGC Standby Check

6.3.1.5.6.1 On K-148 enter the following"

VERB 60	ENTR

6.3.1.5.6.2 On DSKY depress STBY pushbutton for approximately 3 seconds.

6.3.1.5.6.3 Verify STBY status indicator lamp is ON.

6.3.1.5.6.4 On the CRT, verify the 3.2 KC 28V Supply (CG 1331) is between 28.04 and 29.16V RMS.

6.3.1.5.6.5 On DSKY depress STBY pushbutton for approximately 3 seconds to return to LGC OPERATE mode.

6.3.1.5.6.6 Verify STBY status indicator lamp is OFF.
RESTART light may be ON, Verify LGC WARNING OFF and PGNCS CAUTION ON.

6.3.1.5.6.7 On K-148 enter the following:

VERB 61	ENTR

6.3.1.5.7 Standby/Proceed Check

6.3.1.5.7.1 On K-148 enter the following:

VERB 11	NOUN 10	ENTR
00032		ENTR

6.3.1.5.7.2 On the DSKY press and hold the STBY pushbutton. Verify Row 1 of the DSKY displays 57777.

6.3.2 Alarms and Interrupts Test

6.3.2.1 Parity Fail Test

6.3.2.1.1 On K-148 enter the following sequence:

VERB 21	NOUN 02	ENTR
03377		ENTR
33777		ENTR

6.3.2.4 Nightwatchman Test

6.3.2.4.1 On K-148 enter the following sequence

```
VERB 24    NOUN 01        ENTR
03377  ENTR
30001  ENTR
03377  ENTR
VERB 25    NOUN 26        ENTR
03400 ENTR
01777 ENTR
00006 ENTR
VERB 30    ENTR
```

6.3.2.4.2 Verify RESTART, and PGNCS CAUTION lamps are ON.

6.3.2.4.3 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.3 IMU OPERATE POWER ON TESTS

CAUTION

Prior to application of IMU OPERATE power in step 6.3.3.1.4, LGC OPERATE and IMU STANDBY power must have been applied to the G&N System continuously for a minimum of two hours. The only exception is when the requirements of step 6.2.4.10 are met and this does not apply for the initial application of IMU OPERATE power.

6.3.4 Temperature Control Verification

6.3.4.1 After IMU OPERATE turn-on, periodically check the PIPA TEMP for the next 15 minutes. The PIPA TEMP shall be within 0.5° of the PIPA TEMP measured in 6.3.1.3.4. 15 minutes after IMU OPERATE turn on the PIPA temperature shall be within 0.5° F of its stabilized value.

6.3.4.2 When 30 minutes have elapsed from the time of IMU OPERATE power turn-on record IRIG TEMP (GG 2301). The IRIG TEMP shall be within 0.5° of its stabilized value.

6.3.4.3 When 1 hour has elapsed from the time of IMU OPERATE power turn-on, monitor PIPA TEMP (GG 2300) and IRIG TEMP (GG 2301) on the CRT. Monitor and record temperature readings every 5 minutes for 30 minutes. Verify that each reading does not deviate from the average value of each signal by more than 0.1°F.

6.3.4.4 The PIPA Temp shall be 130.5 (±1.5)°F. The IRIG TEMP shall be 135 (±2.5°)F.

6.3.4.5 The PIPA TEMP recorded in step 6.3.4.4 shall be within 1.0°F of the temperature recorded in steps 6.3.1.3.4 and within 0.5°F of the PIPA TEMP recorded in 6.3.4.1.

6.3.4.6 The IRIG TEMP recorded in step 6.3.4.4 shall be within 0.5°F of the temperature recorded in step 6.3.4.2.

6.3.4.7 Verify on the event recorder that IMU Blower Current (GG 2303) and IMU Heater Current (GG 2302) On discretes have been present for the last hour (discretes may cycle off).

6.3.5 PGNCS Power Supply Tests

6.3.5.1 From the CRT, confirm power supply voltages (or temperatures) are as specified and record values observed.

6.3.5.2 The PIPA Calibration Module Temperature (GG 6020) shall be between +45 and +90 DEG F.

6.3.5.3 The PSA Temperature (GG 6021) shall be between +60 and +110 DEG F.

6.3.5.4 The LGC Temperature (GG 4300) shall be between +45 and +130 DEG. F.

6.3.5.5 The +28 VDC IMU OPERATE BUS (GG 1500) shall be between 24.5 and 33.5 VDC.

6.3.5.6 The +28 VDC IMU STANDBY BUS (GG 1510) shall be between 24.5 and 33.5 VDC.

6.3.5.7 The +28 VDC LGC OPERATE BUS (GG 1520) shall be between 23.5 and 32.5 VDC.

6.3.5.8 The +120 VDC PIPA Supply (GG 1040) shall be between 114 and 126 VDC.

6.3.5.9 The -28 VDC Supply (GG 1100) shall be between -21.5 and -33.5 VDC.

6.3.5.10 The +4 VDC CDU Supply (GG 1070) shall be between 3.8 and 4.2 VDC.

6.3.5.11 The IMU 28V/800 CPS 1 pct Supply (GG 1201) shall be between 27.44 and 28.56 VRMS.

6.3.5.12 The IMU 28V 800 CPS 5 pct 90 PH Supply (GG 1202) shall be between 26.6 and 29.4 VRMS.

6.3.5.13 The IMU 28V 800 CPS 5 pct 0 PH Supply (GG 1203) shall be between 25.9 and 30.1 VRMS.

6.3.5.14 The 3.2 KC 28V Supply (GG 1331) shall be between 28.04 and 29.16 VRMS.

6.3.5.15 The 2.5 VDC T/M Bias (GG 1110) shall be between 2.4 and 2.6 VDC.

6.3.5.16 The +14 VDC LGC Supply (GG 1020) shall be between 13.6 and 14.4 VDC.

6.3.5.17 The +4 VDC LGC Supply (GG 1030) shall be between 3.8 and 4.2 VDC.

6.3.5.18 The phase difference between the 3.2 KC supply and LGC sync shall be 0±10° (NG 1336).

6.3.5.19 Record the noise levels of the following signals displayed on the CRT.

Item No.	Measurement No.	Signal	Requirement
a.	NG 1021	14 VDC LGC Noise RMS	<0.4 VRMS
b.	NG 1031	4 VDC LGC Noise RMS	<0.4 VRMS
c.	NG 1071	4 VDC CDU Noise RMS	<1.0 VRMS
d.	NG 1501	28 VDC IMU Operate Noise RMS	<1.0 VRMS
e.	NG 1511	28 VDC IMU Standby Noise RMS	<1.0 VRMS
f.	NG 1521	28 VDC LGC Operate Noise RMS	<2.0 VRMS

6.3.5.20 The noise peaks of the following signals are demonstrated on the event light when the peaks have a rise time between 2 and 50 μsec and the peak voltage exceeds 5 volts.

Item No.	Measurement No.	Signal
a.	NG 1022	14 VDC LGC Noise Peak
b.	NG 1032	4 VDC LGC Noise Peak
c.	NG 1072	4 VDC CDU Noise Peak
d.	NG 1502	28 VDC IMU Operate Noise Peak
e.	NG 1522	28 VDC LGC Operate Peak

6.3.5.21 The noise peaks of the following signals are demonstrated on the event light when the peaks have a rise time of between 2 and 50 μsec and the peak voltage exceeds 10 volts.

a.	NG 1512	28 VDC IMU Standby Peak.

6.3.6 IMU OPERATIONAL TEST

6.3.6.1 On K-148 enter the following:

VERB 01 NOUN 10 ENTR
00003 ENTR
Record CRT DSKY Row 1 indication AAAAA and the time of day.

6.3.6.2 On K-148 enter the following:

VERB 21 NOUN 01 ENTR
03377 ENTR
AAAAA ENTR
VERB 06 NOUN 02 ENTR
03377 ENTR
Record CRT DSKY Row 1 indication as ±BBBBB

6.3.6.3 Perform the following calculations:

a. $\frac{\text{BBBBB} \times 5.12}{3600}$ = CCCC.C (Contents (hrs) of high order scalar register)

b. 23.3 - CCCC.C = DDDD.D hours

c. DDDD.D + time of day recorded in 6.3.6.1 = time of day at which high order scalar register will overflow.

6.3.6.4 If time of day is within 12 minutes of that calculated in 6.3.6.3.c when about to perform any of the following paragraphs, wait until that time calculated in 6.3.6.3.c has passed and proceed.

6.3.6.5 In K-148 enter the following sequence:

VERB 57 ENTR
00004 ENTR

6.3.6.6 Wait 200 seconds, then verify on the CRT, that the X, Y and Z PIPA SG Output signals all indicate 0.0±2.5 Volts but not 0.

6.3.6.7 Approximately 12 minutes after performing step 6.3.6.1, VERB 06 NOUN 66 shall flash.

6.3.7.2 Command Accuracy 0°

6.3.7.2.1 On K-148, press ENTR
VERB 33 NOUN 02 is Displayed Flashing in approximately 5 seconds.
On Event Module ISS WARNING Lamp may light.
Press ENTR
VERB 33 NOUN 03 is Displayed Flashing after approximately 20 seconds.

6.3.7.2.2 Read and record the CRT IMU Gimbal angles. The indications shall be 000±001 degree.

6.3.7.2.3 Read and record CRT the DSKY Row 1, 2, and 3 indications. The indications shall be +00000 ± 00030.

6.3.7.3 Command Accuracy 45°.

6.3.7.3.1 On K-148, press ENTR, VERB 33 NOUN 04 is displayed flashing after approximately 20 seconds.

6.3.7.3.2 Read and record the CRT IMU Gimbal angle. The indications shall be 045 ± 001 degrees.

6.3.7.3.3 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be +04500 ± 00030.

6.3.7.4 CDU Repeating Accuracy 45°

6.3.7.4.1 On K-148 press ENTR. In about 4 seconds VERB 05 NOUN 30 is displayed flashing.

6.3.7.4.2 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be between 77774 and 00003.

6.3.7.5 Command Accuracy 90°.

6.3.7.5.1 On K-148 Press VERB 33, ENTR. In approximately 20 seconds VERB 33 NOUN 06 is displayed flashing. The GIMBAL LOCK lamp on DSKY shall be lighted.

6.3.7.5.2 Read and record the CRT IMU Gimbal angle. The indications shall be 090 ± 001 degrees.

6.3.7.5.3 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indication shall be +09000 ± 00030.

6.3.7.6 Command Accuracy 135°.

6.3.7.6.1 On K-148 press ENTR. In approximately 20 seconds VERB 33 NOUN 07 is displayed flashing.

6.3.7.6.2 Read and record the CRT IMU Gimbal Angle indication. The indications shall be 135 ± 001 degrees.

6.3.7.6.3 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be +13500 ± 00030.

6.3.7.7 On K-148 press ENTR. In approximately 20 seconds VERB 33 NOUN 10 is displayed flashing. The GIMBAL LOCK lamp on DSKY shall not be lighted.

6.3.7.8 CDU Repeating Accuracy 135°.

6.3.7.8.1 On K-148 press ENTR pushbutton. In about 4 seconds, VERB 05 NOUN 30 is displayed flashing.

6.3.7.8.2 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be between 77774 and 00003.

6.3.7.9 + Gimbal Lock Test

6.3.7.9.1 On K-148, Press VERB 33, ENTR. In approximately 20 seconds VERB 33 NOUN 12 is displayed flashing. The GIMBAL LOCK lamp on DSKY shall be lighted.

6.3.7.10 Command Accuracy 225°.

6.3.7.10.1 On K-148 press ENTR. In approximately 20 seconds, VERB 33, NOUN 13 is displayed flashing.

6.3.7.10.2 Read and record the CRT IMU Gimbal Angle indications. The indication shall be 225±001 degrees.

6.3.7.10.3 Read and record CRT DSKY Rows 1, 2, and 3 indications. The indications shall be +225 00 ± 00030.

6.3.7.11 On K-148 press ENTR. In approximately 20 seconds VERB 33 NOUN 14 is displayed. The GIMBAL LOCK lamp shall not be lighted flashing.

6.3.7.12 CDU Command Rate Test.

6.3.7.12.1 On K-148 press ENTR. In approximately 30 seconds VERB 06 NOUN 66 is displayed flashing. The GIMBAL LOCK lamp on DSKY shall be lighted.

6.3.7.12.2 Read and record the CRT DSKY Row 1, 2, and 3 indications. The indication shall be between 00012 and 00016.

6.3.7.12.3 On K-148 insert VERB 33 ENTR. In approximately 30 seconds VERB 06 and NOUN 66 is displayed flashing. Repeat 6.3.7.12.2. The GIMBAL LOCK lamp on DSKY shall not be lighted.

6.3.7.12.4 On K-148 insert VERB 33 ENTR. In approximately 30 seconds VERB 06 and NOUN 66 is displayed flashing. Repeat 6.3.7.12.2. The GIMBAL LOCK lamp on the DSKY shall not be lighted.

6.3.7.13 Command Accuracy 315° .

6.3.7.13.1 On K-148 insert VERB 33 ENTR. In approximately 20 seconds VERB 33 NOUN 20 will be displayed flashing.

6.3.7.13.2 Read and record CRT IMU Gimbal Angles. The indicator shall be 315±001 degrees.

6.3.7.13.3 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be +31500±00030.

6.3.7.14 CDU Repeating Accuracy 315° .

6.3.7.14.1 On K-148 press ENTR. In approximately 4 seconds VERB 05 NOUN 30 is displayed flashing.

6.3.7.14.2 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indications shall be between 77774 and 00003.

6.3.7.15 -Gimbal Lock Test

6.3.7.15.1 On K-148 Press VERB 33 ENTR. In approximately 20 seconds VERB 33, NOUN 22 is displayed flashing. The GIMBAL LOCK lamp on DSKY shall be lighted.

6.3.7.15.2 On K-148 Press ENTR. In approximately 20 seconds VERB 33 NOUN 23 will be displayed flashing.

6.3.7.15.3 Read and record the CRT DSKY Rows 1, 2 and 3 indications. The indications shall be:

Row 1 22500±00030
Row 2 22500±00030
Row 3 22500±00030

6.3.7.16 CDU Repeating Accuracy 225° .

6.3.7.16.1 On K-148 press ENTR. In about 4 seconds, VERB 05 NOUN 30 is displayed flashing.

6.3.7.16.2 Read and record the CRT DSKY Rows 1, 2, and 3 indications. The indication shall be between 77774 and 00003.

6.3.7.17 On K-148 Press VERB 33 ENTR. The GIMBAL LOCK lamp shall not be lighted. VERB 21, NOUN 22 is displayed flashing.

6.3.7.18 IMU CDU Fine Fail Test

6.3.7.18.1 On K-148 insert the following sequence
+00100 ENTR
+00100 ENTR
+00100 ENTR
On Event Module verify that ISS WARNING lamp lights in approximately 20 seconds.

6.3.7.18.2 After approximately 20 seconds, VERB 01 NOUN 10 shall be displayed. Verify that CRT DSKY display Row 1 indicates 33XXX or 32XXX.

6.3.7.19 IMU CDU Coarse Fail Test

6.3.7.19.1 On K-148 insert the following sequence

VERB 33 ENTR
+03375 ENTR
+03379 ENTR
+03378 ENTR
On Event Module verify that ISS WARNING lamp lights in approximately 20 seconds.

6.3.7.19.2 After approximately 20 seconds, VERB 01 NOUN 10 shall be displayed. Verify that CRT DSKY display of Row 1 indicates 33XXX or 32XXX.

6.3.7.20 FDAI Linearity Test

6.3.7.20.1 On K-148 enter VERB 33 ENTR
VERB 33 NOUN 27 shall be displayed.

6.3.7.20.2 On CRT verify the following:

PITCH ATT ERROR is between +15.3 and +18.7 DEG (GG 2219)
YAW ATT ERROR is between +15.3 and +18.7 DEG (GG 2249)
ROLL ATT ERROR is between +15.3 and +18.7 DEG (GG 2279)

6.3.7.20.3 On K-148 press ENTR.
VERB 33 NOUN 30 shall be displayed.

6.3.7.20.4 On CRT verify the following:

PITCH ATT ERROR is between +14.4 and +17.6 DEG (GG 2219)
YAW ATT ERROR is between +14.4 and +17.6 DEG (GG 2249)
ROLL ATT ERROR is between +14.4 and +17.6 DEG (GG 2279)

6.3.7.20.5 On K-148 press ENTR.
VERB 33 NOUN 31 shall be displayed

6.3.7.20.6 On CRT verify the following:

PITCH ATT ERROR is between +05.4 and +06.6 DEG (GG 2219)
YAW ATT ERROR is between +05.4 and +06.6 DEG (GG 2249)
ROLL ATT ERROR is between +05.4 and +06.6 DEG (GG 2279)

6.3.7.20.7 On K-148 press ENTR.
VERB 33 NOUN 32 shall be displayed.

6.3.7.20.8 On CRT verify the following:

PITCH ATT ERROR is between +00.2 and -00.2 DEG (GG 2219)
YAW ATT ERROR is between +00.2 and -00.2 DEG (GG 2249)
ROLL ATT ERROR is between +00.2 and -00.2 DEG (GG 2279)

6.3.7.20.9 On K-148 press ENTR.
VERB 33 NOUN 33 shall be displayed.

6.3.7.20.10 On CRT verify the following:

PITCH ATT ERROR is between -05.4 and -06.6 DEG (GG 2219)
YAW ATT ERROR is between -05.4 and -06.6 DEG (GG 2249)
ROLL ATT ERROR is between -05.4 and -06.6 DEG (GG 2279)

6.3.7.20.11 On K-148 press ENTR.
VERB 33 NOUN 34 shall be displayed.

6.3.7.20.12 On CRT verify the following:

PITCH ATT ERROR is between -14.4 and -17.6 DEG (GG 2219)
YAW ATT ERROR is between -14.4 and -17.6 DEG (GG 2249)
ROLL ATT ERROR is between -14.4 and -17.6 DEG (GG 2279)

6.3.7.20.13 On K-148 press ENTR.
VERB 33 NOUN 35 shall be displayed.

6.3.7.20.14 On CRT verify the following:

PITCH ATT ERROR is between -15.3 and -18.7 DEG (GG 2219)
YAW ATT ERROR is between -15.3 and -18.7 DEG (GG 2249)
ROLL ATT ERROR is between -15.3 and -18.7 DEG (GG 2279)

6.3.7.21 On K-148 enter VERB 36 ENTR.

The proper operation of the IMU CAGE function (consisting of steps 6.3.7.21 thru 6.3.7.23) need be performed only once during the initial PGNCS Operational Test and omitted from subsequent testing of test 6.3.7.

6.3.7.21.1 On K-148 enter the following sequence:

VERB 36	ENTR
VERB 41 NOUN 20	ENTR
+00000	ENTR
+00100	ENTR
+00000	ENTR

6.3.7.21.2 On the CRT, verify the following:

OG 1X Resolver Sin (11°) is between +06.50° and +09.50° (GG 2181)
IG 1X Resolver Sin (11°) is between -00.50 and +02.50 Deg (GG 2121)
MG 1X Resolver Sin (11°) is between -06.50 and -09.50 Deg (GG 2151)

6.3.7.21.3 On analog recorder, monitor the following signals:

SIGNAL NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2106	IG Servo Error Total
c. GG 2166	OG Servo Error Total
d. GG 2112	IG 1X Resolver Sine
e. GG 2172	OG 1X Resolver Sine
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1% 800 cps

6.3.7.21.4 Deleted.

6.3.7.21.5 On LEM Cabin Panel 4, hold IMU CAGE momentary toggle switch in the ON position. (Do not release.)

6.3.7.21.6 On analog recorder, verify the 1X Resolver Sine signals (GG 2112, GG 2172, GG 2142) null out to less than 0.5 VRMS. Release IMU CAGE switch to the OFF position. Disregard any momentary transients on the 1X Resolver Sine signals when the switch is released. Any sustained oscillations shall be cause for immediate removal of IMU Operate power.

6.3.7.21.7 On the CRT, verify all IMU gimbal angles indicate between 358 and 002.

6.3.7.22 Stop analog recorder.

6.3.7.22.1 On K-148 insert the following:

VERB 43	ENTR
+01700	ENTR
+00600	ENTR
-01700	ENTR

On CRT verify the following:

YAW ATT ERROR is between +15.3 and +18.7 Deg (GG 2249).
PITCH ATT ERROR is between +05.4 and +06.6 Deg (GG 2219).
ROLL ATT ERROR is between -15.3 and -18.7 Deg (GG 2279).

6.3.7.23 Deleted.

6.3.7.24 Deleted.

6.3.7.25 On K-148 enter the following:

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

6.3.9.21 In approximately 12 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R2 (+NBDZ Position +00002).

6.3.9.22 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.23 Approximately 5 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R1 and R2 (-X PIPA Position +00002).

6.3.9.24 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.25 In approximately 67 minutes, VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R2 (-NBDX + ADIAX Pos +00002).

6.3.9.26 On K-148 enter the following sequence:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.27 On CRT, DSKY display, verify R1 = +00600, R2 = +00000, and R3 = +00003.

6.3.9.28 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.29 In approximately 12 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R2 (-NBDX Position +00003).

6.3.9.30 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.31 In approximately 5 minutes, VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R1 and R2 (+Z PIPA Position +00003).

6.3.9.32 On K-148 enter the following sequence:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash.

6.3.9.33 On the CRT, DSKY display verify R1 = +00600, R2 = 00000, and R3 = +00004.

6.3.9.34 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.35 In approximately 12 minutes, VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R2 (+NBDY + ADSRAY Position +00004).

6.3.9.36 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.37 Deleted.

6.3.9.38 In approximately 5 minutes, VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R1 and R2 (-Z PIPA Position +00004).

6.3.9.39 On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.40 In approximately 67 minutes VERB 06 NOUN 66 shall flash. From the CRT DSKY display record R2 (+NBDZ + ADIAZ Position +00004).

6.3.9.41 On K-148 enter the following sequence:

VERB 33 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.42 From the CRT, DSKY display verify R1 = +00600, R2 = +00000 and R3 = +00005.

6.3.9.43 Record time. On K-148 enter the following sequence.

VERB 33 ENTR

6.3.9.44 The PROG alarm and GIMBAL LOCK lamps shall light. Press Error Reset.

6.3.9.45 In approximately 5 minutes, VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R1 and R2 (+Y PIPA Position +00005). Correct measured g term per 6.3.9.70.1 and transfer results to line k.

6.3.9.46 On K-148 enter the following sequence:

VERB 34 ENTR
VERB 06 NOUN 66 shall flash

6.3.9.47 On the CRT, DSKY display verify R1 = +00600, R2 = +00000 and R3 = +00006.

6.3.9.48 Record time. On K-148 enter the following sequence:

VERB 33 ENTR

6.3.9.49 The PROG alarm and GIMBAL LOCK lamps shall light. Press Error Reset.

6.3.9.50 In approximately 5 minutes VERB 06 NOUN 66 shall flash. From the CRT, DSKY display record R1 and R2. (-Y PIPA Position +00006). Correct measured g term per 6.3.9.70.1 and transfer results to line l.

6.3.9.51 On K-148 enter the following sequence:

VERB 34 ENTR

VERB 06 NOUN 66 shall flash

6.3.9.67 Terminate this test by entering in K-148 the following:

VERB 36 ENTR

6.3.9.68 On CRT, record IRIG TEMP (CG2301) and PIPA TEMP (CG 2300).

6.3.9.69 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.9.70 Calculations,
NOTE: Use Post Vibration or System Test data points only.

6.3.9.70.1 Y PIPA Data Correction Calculation

6.3.9.70.1.1 From the uplink file tape, the compressed data tape or the PCM tape, request a data reduction of the X and Z accelerometer ΔV counts (addresses 37 and 41 respectively) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the period during which the Y PIPA test was being performed in positions 5 and 6 of the IMU Performance test.

6.3.9.70.1.2 Perform the following calculations for position 5.

$$G'_5 = \frac{G_5}{\text{Cos } \theta}$$

where:

G_5 = Measured acceleration turn (line k)

G'_5 = Corrected acceleration term

$$\text{Cos } \theta y_5 = 1 - \frac{1}{2}\theta^2 y_5 \quad \text{for small angles}$$

$$\theta y_5 = \sqrt{\theta^2_{x5} + \theta^2_{z5}}$$

and:

$$\theta_{z5} = (\Delta v_{x5} - \Delta V_z \text{ Bias}) (\text{S.F.}_z)/ (\Delta T) (\text{local g})$$

$$\theta_{x5} = (\Delta V_{z5} - \Delta V_z \text{ Bias}) (\text{S.F.}_z)/(\Delta T) (\text{local g})$$

and:

V_x Bias = (X PIPA Bias) (ΔT) / S. F.$_x$

V_z Bias = (Z PIPA Bias) (ΔT) / S. V.$_z$

S. F. and Bias terms are obtained from positions 1 through 4 of the IMU Performance Test.

6.3.9.70.1.3 Perform the following calculations for position 6.

$$G'_6 = \frac{G_6}{\text{Cos } \theta y_6}$$

Where:

G_6 = Measured acceleration term (line e)

G'_6 = Corrected acceleration term

$\text{Cos } \theta y_6 = \frac{1 - 1}{\theta^2 y_6}$ for small angles

$$\theta y_6 = \theta^2_{x6} + \theta^2_{z6}$$

and:

θ_{z6} = (ΔV_{x6} - ΔV_x Bias) (S. F.$_x$) / (ΔT) (local g)

θ_{x6} = (ΔV_{z6} - ΔV_z Bias) (S. F.$_z$) / (ΔT) (local g)

and:

V_x Bias = (X PIPA Bias) (ΔT) / S. F.$_x$

V_z Bias = (Z PIPA Bias) (ΔT) / S. F.$_z$

S. F. and Bias terms are obtained from positions 1 through 4 of the IMU Performance Test.

6.3.9.70.2 Obtain data from last IRIG and/or PIPA test and fill in Data Sheet x_{i-1}.

6.3.9.70.3 Obtain data from second last IRIG and/or PIPA test and fill in Data Sheet x_{i-2}.

6.3.9.70.4 Obtain data from third last IRIG and/or PIPA test and fill in Data Sheet x_{i-3}.

6.3.9.70.5 Perform the following calculations for each item appearing on Data Sheet x_i and transfer all results to lines au through bi.

NOTE:

See paragraph 5.6 before continuing.

$$D_1 = \left| x_{i-1} - x_i \right|$$

$$D_2 = \left| x_{i-1} - x_i \right| + \left| x_{i-2} - x_{i-1} \right|$$

$$D_3 = \left| x_{i-3} - x_{i-2} \right| + \left| x_{i-2} - x_{i-1} \right| + \left| x_{i-1} - x_i \right|$$

DATA SHEET

CALCULATION	PARAMETER	UNITS	
line c - line f = ( ) ---.-- (-NBDX+ADIAX) - (-NBDX) Transfer result to line al.	ADIAX	meru/g	q
line h - line a = ( ) ---.-- (+NBDY+ADSRAY) - (-NBDY) Transfer result to line ai.	ADSRAY	meru/g	r
line j - line c = ( ) ---.-- (+NBDZ+ADIAZ) - (NBDZ) Transfer result to line am.	ADIAX	meru/g	s
(line m - line f) X1.414 = ( ) ---.-- (-NBDX + .707 ADSRAX) -(-NBDX) X 1.414 Transfer result to line ak.	ADSRAX	meru/g	t
(line o + line c) X1.414 = ( ) ---.-- (-NBDZ + .707 ADSRAZ + NBDZ) X 1.414 Transfer result to line aj.	ADSRAZ	meru/g	u
(line p - .707 line a - .707 line f +.5 line q -.5 line t) X2 = ---.-- [.707 (NBDY-NBDX) +.5 (ADIAY-ADIAX) +.5 ADSRAX -.707 (-NBDX) -.707 NBDY +.5 ADIAX - .5 ADSRAX] X2 Transfer result to line an.	ADIAY	meru/g	v
line b - line d = ( )	PIPA X2G	cm/sec^2	w
line k - line l = ( )	PIPA Y2G	cm/sec^2	x
line g - line i = ( )	PIPA Z2G	cm/sec^2	y
1958.48 ÷ line w x 1 cm/sec pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ao.	X PIPA S. F.	cm/sec/ pulse	z
1958.48 ÷ line x X1cm/sec/pulse = Subtract 1.000000 from this value, multiply X10^6 and transfer results to line ap.	Y PIPA S. F.	cm/sec/ pulse	aa
1958.48 ÷ line y X 1 cm/sec/ pulse = Subtract 1.000000 from this value, multiply X10^6 and transfer results to line aq.	Z PIPA S. F.	cm/sec/ pulse	ab
1/2 (line b + line d) = ( ) --.--- Transfer results to line ar.	X PIPA Bias	cm/sec^2	ac
1/2 (line k + line l) = ( ) --.--- Transfer results to line as.	Y PIPA Bias	cm/sec^2	ad
1/2 (line g + line i) = ( ) --.--- Transfer results to line at.	Z PIPA Bias	cm/sec^2	ae

DATA SHEET
(x_1)

PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
NBDY	meru	-15		+15			af
NBDZ	meru	-15		+15			ag
NBDX	meru	-15		+15			ah
ADSRAY	meru/g	-40		+40			ai
ADSRAZ	meru/g	-40		+40			aj
ADSRAX	meru/g	-40		+40			ah
ADIAX	meru/g	-100		+100			al
ADIAZ	meru/g	-100		+100			am
ADIAY	meru/g	-100		+100			an
X PIPA S. F. error from line z	PPM	-1900		+1900			ao
X PIPA S. F. error from line aa	PPM	-1900		+1900			ap
Z PIPA S. F. error from line ab	PPM	-1900		+1900			aq
X PIPA Bias from line ac	cm/sec^2	-3.1		+3.1			ar
X PIPA Bias from line ad	cm/sec^2	-3.1		+3.1			as
Z PIPA Bias from line ae	cm/sec^2	-3.1		+3.1			at

DATA SHEET
(x_{i-1})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET
(x_{1-2})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET
(Z4-3)

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET

PARAMETER	UNITS	D_1	MAX	D_2	MAX	D_3	MAX	
NBDY	meru		6		9		11	au
NBDZ	meru		6		9		11	av
NBDX	meru		6		9		11	aw
ADSRAY	meru/g		14		21		25	ax
ADSRAZ	meru/g		14		21		25	ay
ADSRAX	meru/g		14		21		25	az
ADIAX	meru/g		17		33		40	ba
ADIAZ	meru/g		17		33		40	bb
ADIAY	meru/g		17		33		40	bc
X PIPA S. F.	Error PPM		400		500		600	bd
Y PIPA S. F.	Error PPM		400		500		600	be
Z PIPA S. F.	Error PPM		400		500		600	bf
X PIPA Bias	cm/sec^2		0.5		0.7		0.9	bg
Y PIPA Bias	cm/sec^2		0.5		0.7		0.9	bh
Z PIPA Bias	cm/sec^2		0.5		0.7		0.9	bi

Y	Y'
0	2
1	3
2	2
3	3
4	6
5	7
6	6
7	7

TABLE II

6.3.10 LGC Voltage Margin Test

6.3.10.1 Initial Conditions

6.3.10.1.1 Insure that the G&N System is in the Standby Mode.

6.3.10.1.2 On the CRT, verify the +28 VDC LGC OPERATE bus is between 24.5 and 33.5 vdc (GG 1520).

6.3.10.1.3 On Panel 5 set lighting override ANUN SW to ON. Rotate the ANUN/NUM dimmer fully CCW.

6.3.10.2 Voltage Margin Determination

6.3.10.2.1 On the PSA Adapter Module (PSAAM) (410-31080), place INHIBIT VOLTAGE FAIL switch to ON.

CAUTION: The +4 vdc LGC Supply voltage shall never be operated lower than +2.5 vdc or higher than +5.2 vdc (GG 1030).

The +14 vdc LGC Supply shall never be operated less than +8.5 vdc or higher than +17.0 vdc (GG 1020).

LTG-ANUN/NUM Control on panel 5 shall be set to DIM during the performance of the Voltage Margin Test in order to avoid decreasing the operating life of the DSKY EL lamps.

NOTE: The flashing indication of the LGC supplies may be disregarded for this test. The charts in Table III may be used to determine approximate values for the "XX.X" values of C-156 voltage dial settings corresponding to various power supply voltages.

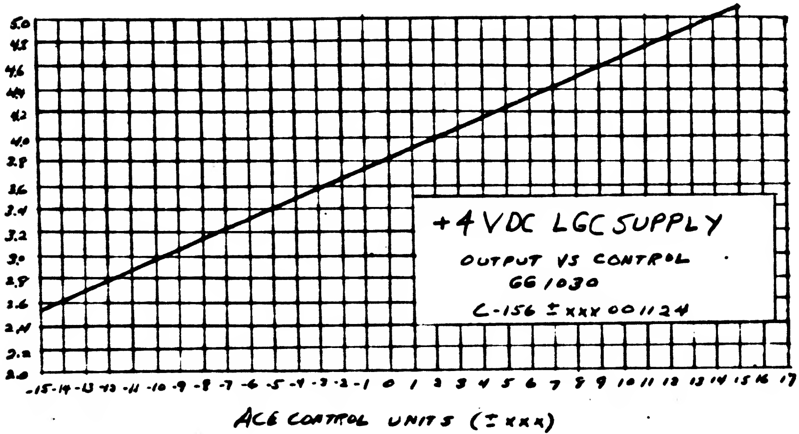
6.3.10.2.2 Enter 0001 into R155. Verify and execute.

6.3.10.2.3 Enter 1111 into R154. .Verify and execute.

6.3.10.2.4 Enter in C-156 ±XX.X001114. (Enter a value for XX.X which will adjust the +14V power supply (GG 1020) as monitored on the CRT, to 12.1 (+0.1, -0.0) vdc. See Table III. Execute.

6.3.10.2.5 Enter in C-156 ±XX.X001124 (Enter a value for XX.X which will adjust the +4V power supply (GG 1030) as monitored on the CRT, to 3.4 (+0.03, -0.0) vdc. See Table III. Execute.

6.3.10.2.6 On K-148 press ERROR RESET.


5.0
4.8
4.6
4.4
4.2
4.0
3.8
3.6
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
ACE CONTROL UNITS (± XXX)
+4 VDC LGC SUPPLY
OUTPUT VS CONTROL
GG 1030
C-156 ± XXX 001124

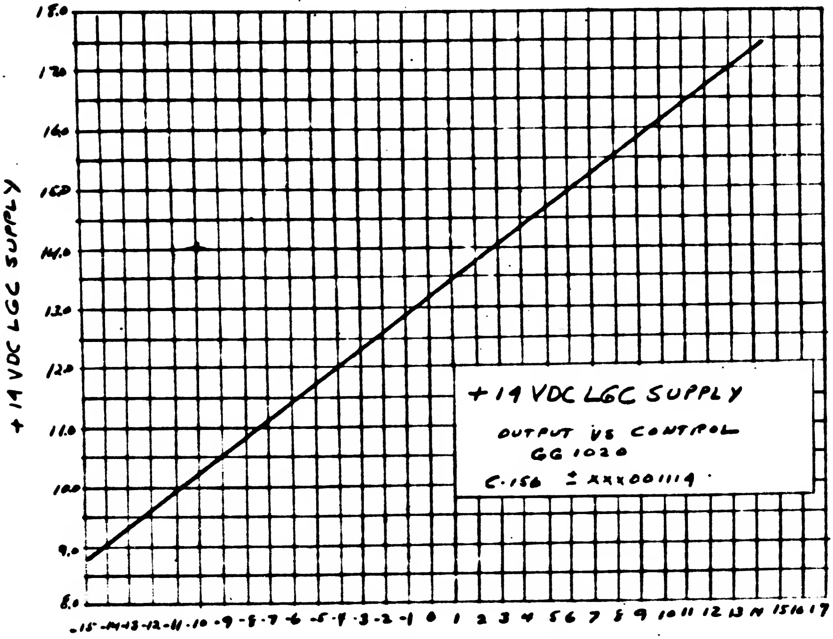

18.0
17.0
16.0
15.0
14.0
13.0
12.0
11.0
10.0
9.0
8.0
+14 VDC LGC SUPPLY
-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
+14 VDC LGC SUPPLY
OUTPUT VS CONTROL
GG 1020
C-156 ± XXX 001114

TABLE III

6.3.10.2.7 On K-148 initiate LGC Self-Check by entering the following:

VERB 21 NOUN 27 ENTR
77767 ENTR

Wait 200 seconds. Verify RESTART lamp on the DSKY is not lit.

6.3.10.2.7.1 Into R154 insert 0101. Verify and execute.

6.3.10.2.8 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lighted.

6.3.10.2.9 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL switch to ON. Press ERROR RESET. Perform the following DSKY operations:

VERB 21 NOUN 27 ENTR
77767 ENTR

6.3.10.2.10 Enter in C-156 (±) XX.X001114 (Enter a value for XX.X which will adjust the +14V power supply (GG 1020) as monitored on the CRT, to 16.4 (+0.0, -0.1) vdc. See Table III. Execute.

6.3.10.2.11 On K-148 press ERROR RESET. Wait 200 seconds. Verify RESTART lamp on DSKY is not lighted.

6.3.10.2.11.1 Into R154 insert 0101. Verify and execute.

6.3.10.2.12 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lighted. Set the INHIBIT VOLTAGE FAIL switch to ON. Press ERROR RESET. Perform the following DSKY operations.

VERB 21 NOUN 27 ENTR
77767 ENTR

6.3.10.2.13 Enter in C-156 +XX.X001124 (Enter a value for XX.X which will adjust the 4V power supply (GG 1030) as monitored on the CRT, to 4.6 (+0.0, -0.03) vdc. See Table III. Execute.

6.3.10.2.14 On K-148 press ERROR RESET. Wait 200 seconds. Verify RESTART lamp on DSKY is not lit.

6.3.10.2.14.1 Into R154 insert 0101. Verify and execute.

6.3.10.2.15 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL Switch to OFF. Verify RESTART lamp on the DSKY is lit. Set the INHIBIT VOLTAGE FAIL switch to ON. Press ERROR RESET. Perform the following DSKY operations:

VERB 21 NOUN 27 ENTR
77767 ENTR

6.3.10.2.16 Enter in C-156 (±) XX.X001114 (Enter a value for XX.X which will adjust the 14V power supply (GG 1020) as monitored on the CRT, to 12.1 (+0.1, -0.0) vdc. See Table III. Execute.

6.3.10.2.17 On K-148 press ERROR Reset. Wait 200 seconds. Verify RESTART lamp on DSKY is not lighted.

6.3.10.2.17.1 Into R154 insert 0101. Verify and execute.

6.3.10.2.18 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lighted.

6.3.10.2.19 On R-154 enter 0000. Execute.

6.3.10.2.20 On R-155 enter 0000. Execute.

6.3.10.2.21 On K-148 terminate the LGC Self-Check by entering the following:

VERB 21 NOUN 27 ENTR
00000 ENTR

6.3.10.2.22 On K-148 press ERROR RESET

6.3.11 LGC Clock Frequency Test

6.3.11.1 Insure that LGC Operate power has been applied for a minimum of 10 minutes.

6.3.11.2 Verify that the counter is connected to the 3.2 kc signal on the hardline.

6.3.11.3 Deleted.

6.3.11.4 Deleted.

6.3.11.5 Deleted.

6.3.11.6 Deleted.

6.3.11.7 Deleted.

6.3.11.8 Deleted.

6.3.11.9 Deleted

6.3.11.10 Obtain a 30 second sample of clock frequency.

6.3.11.11 Repeat 6.3.11.10 nine times.

6.3.11.12 The average of the 10 previous readings shall be 30.000000±0.000060 seconds.

6.3.11.13 Insure that the System is not in IMU Operate.

6.3.11.14 Enter the following on K-148:

VERB 60 ENTR
Press and hold the STBY pushbutton on the DSKY for 3 seconds.
Verify the Standby lamp is lighted.

6.3.11.15 Repeat steps 6.3.11.10 and 6.3.11.11.

6.3.11.16 Press and hold the STBY pushbutton on the DSKY for 3 seconds. Verify the Standby lamp is not lighted. Restart light may be on.

6.3.11.31 On the DSKY perform the following operation:

```
VERB 36  ENTR
```

6.3.11.32 On panel 11 close PGNS AOT lamp circuit breaker. On the Computer Control and Reticle dimmer assembly, rotate the RETICLE BRIGHTNESS control to its minimum light intensity position. View through the AOT and verify that the reticle lamp is off.

6.3.11.33 While viewing through the AOT, slowly rotate the RETICLE BRIGHTNESS control to increase the reticle brightness until a stop is reached. Observe that the reticle brightness has increased in intensity. Return RETICLE BRIGHTNESS control to off state. On panel 11 open PGNS AOT lamp circuit breaker.

6.3.11.34 AOT eyepiece Heater Test.

6.3.11.34.1 Secure milliameter HP 428B and current probe HP428A-21A.

6.3.11.34.2 Locate P1 at Computer Control and Reticle Dimmer assembly. Push lacing cord away from P1 back to fifth tie point.

6.3.11.34.3 Clip current probe HP428A-21A to blue wire in cable with red arrow pointing away from P1. Measure and record current indication. The current shall be between 139 and 244 ma.

6.3.11.34.4 Remove current probe, push lacing cord back to P1 and spot tie.

6.3.12 Gimbal Friction Test

6.3.12.1 Inner Gimbal Friction Test

6.3.12.1.1 On K-148 enter the following sequence:

```
VERB 41    NOUN 20    ENTR
+00000                ENTR
+00000                ENTR
+00000                ENTR
Wait 15 seconds
VERB 41    NOUN 20    ENTR
+17000                ENTR
+17000                ENTR
+17000                ENTR
Wait 15 seconds
VERB 41    NOUN 20    ENTR
+27000                ENTR
+27000                ENTR
+27000                ENTR
Wait 15 seconds
VERB 41    NOUN 20    ENTR
+00000                ENTR
+00000                ENTR
+00000                ENTR
```

6.3.12.1.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00200).

6.3.12.1.3 Set up Analog Recorder to monitor the following signals:

MEAS. NO.	SIGNAL NAME
a. GG 2110	IG Torque Motor Current
b. GG 2106	IG Servo Error Total
c. GG 2107	IG Servo Error In Phase
d. GG 2112	IG 1x Resolver Sine
e. GG 2113	IG 1x Resolver Cosine
f. GG 2220	IG CDU Fine Error
g. GG 1201	IMU 28V 1% 800 CPS
h. GG 2221	IG CDU Coarse Error

6.3.12.1.4 Set up Analog Recorder to monitor the following signals:

MEAS. NO.	SIGNAL NAME
a. GG 2300	PIPA TEMP
b. GG 2301	IRIG TEMP
c. GG 1520	+28 VDC LGC OPR BUS

6.3.12.1.5 After 10 seconds has elapsed since step 6.3.12.1.1, enter the following into K-148:

VERB 21 NOUN 01 ENTR
00403 ENTR
00000 ENTR

6.3.12.1.6 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 = 00000
R3 = 00403

6.3.12.1.7 On K-148 enter the following sequence:

NOUN 15		ENTR
00000	ENTR	ENTR
37777	ENTR	ENTR
37743	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	(once)

6.3.12.1.8 IG-360° TORQUE [illegible]

6.3.12.1.9 On K-148 enter the following sequence:

VERB 01 NOUN 01 ENTR
00366 ENTR
Records contents of Row 1 XXXXY
VERB 21 NOUN 01 ENTR
00366 ENTR
XXXXY' ENTR
Where Y' is obtained from Table II.
VERB 42 ENTR
VERB 33 ENTR

6.3.12.1.10 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.1.11 On K-148 enter the following sequence:

```
VERB 40 NOUN 20 ENTR Wait 3 seconds
VERB 41 NOUN 20 ENTR
+00000  ENTR
+00000  ENTR
+00000  ENTR
```

6.3.12.1.12 On the CRT, verify CDU X, CDU Y, CDU Z all indicate +00000 (±00200).

6.3.12.1.13 After 10 seconds has elapsed since step 6.3.12.1.11 enter the following sequence into K-148:

```
VERB 21 NOUN 01 ENTR
00403  ENTR
00000  ENTR
```

6.3.12.1.14 Verify on CRT, DSKY display.

```
VERB 21  NOUN 01
R1       00000
R3       00403
```

6.3.12.1.15 On K-148 enter the following sequence:

```
NOUN 15 ENTR
00000      ENTR  ENTR
40000      ENTR  ENTR
40034      ENTR  ENTR
00000      ENTR  ENTR
00000      ENTR  (once)
```

6.3.12.1.15 (cont)

40034 ENTR ENTR
Verify R1 = 40034
00000 ENTR ENTR
Verify R1 = 00000
00000 ENTR (once)
Verify R1 = 00000

6.3.12.1.16 IG +360° TORQUE [illegible] 10 [illegible]
([illegible] 360° [illegible])

6.3.12.1.17 On K-148 enter the following sequence

VERB 42 ENTR
VERB 33 ENTR

6.3.12.1.18 Monitor analog recorder. When the IG Torque Motor Current signal (OG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.2 Outer Gimbal Friction Test

6.3.12.2.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 3 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.2.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00200).

6.3.12.2.3 Set up analog recorder to monitor the following:

MEAS NO.	SIGNAL NAME
a. OG 2167	OG Servo Error In Phase
b. OG 2170	OG Torque Motor Current
c. OG 2166	OG Servo Error Total
d. OG 2280	OG CDU Fine Error
e. OG 2172	OG 1X Resolver Sine
f. OG 2173	OG 1X Resolver Cosine
g. GG 2281	OG CDU Coarse Error

6.3.12.2.4 After 10 seconds has elapsed since step 6.3.12.2.1 enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
00403 ENTR
37777 ENTR

6.3.12.2.5 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 37777
R3 00403

6.3.12.2.6 On K-148 enter the following sequence:

NOUN 15 ENTR
37743 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR (once)

6.3.12.2.7 OG -360° TORQUE [illegible])

6.3.12.2.8 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.2.9 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.2.10 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 3 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.2.11 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00200).

6.3.12.2.12 After 10 seconds has elapsed since step 6.3.12.2.10, enter the following sequence into K-148.

VERB 21 NOUN 01 ENTR
00403 ENTR
40000 ENTR

6.3.12.2.13 Verify on CRT, DSKY display.

VERB 21 NOUN 01
R1 40000
R3 00403

6.3.12.2.14 On K-148 enter the following sequence:

NOUN 15 ENTR
40034 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR

6.3.12.2.15 OG +360° TORQUE [illegible] (+360° [illegible])

6.3.12.2.16 On K-148 enter the following sequence

VERB 42 ENTR
VERB 33 ENTR

6.3.12.2.17 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.3 Middle Gimbal Friction Test

6.3.12.3.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 3 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+06750 ENTR

6.3.12.3.2 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00200, and CDU Z = +06750±00200.

6.3.12.3.3 Set up analog recorder to monitor the following:

MEAS. NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2137	MG Servo Error In Phase
c. GG 2140	MG Torque Motor Current
d. GG 2143	MG 1X Resolver Cosine
e. GG 2250	MG CDU Fine Error
f. GG 2142	MG 1X Resolver Sine
g. GG 2251	MG CDU Coarse Error

6.3.12.3.4 After 10 seconds have elapsed since step 6.3.12.3.1, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
00403 ENTR
00000 ENTR

6.3.12.3.5 Verify on CRT, DSKY display

VERB 21	NOUN 01

R1 = 00000
R3 = 00403

6.3.12.3.6 On K-148 enter the following sequence:

NOUN 15	ENTR	
00000	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	ENTR
14000	ENTR	ENTR
00000	ENTR	(once)

6.3.12.3.7 MG - 135° TORQUE

6.3.12.3.8 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.3.9 Monitor analog recorder. When MG Torque Motor Current (GG 2140) drops to a quiescent level (approximately 6 minutes), stop the recorders.

6.3.12.3.10 On K-148 enter the following sequence:

VERB 40	NOUN 20	ENTR	Wait 3 seconds
VERB 41	NOUN 20	ENTR	
+00000	ENTR		
+00000	ENTR		
-06750	ENTR		

6.3.12.3.11 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00200, and CDU Z = -06750±00200.

6.3.12.3.12 After 10 seconds has elapsed since step 6.3.12.3.10, enter the following sequence into K-148:

VERB 21	NOUN 01	ENTR
00403	ENTR	
00000	ENTR	

6.3.12.3.13 On the CRT, DSKY display verify:

VERB 21	NOUN 01
R1 =	00000
R3 =	00403

6.3.12.3.14 On K-148 enter the following sequence:

NOUN 15	ENTR	
00000	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	ENTR
63777	ENTR	ENTR
77777	ENTR	(once)

6.3.12.3.15 MG +135° TORQUE

6.3.12.3.16 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.3.17 Monitor analog recorder. When the MG Torque Motor Current signal (GG 2140) drops to a quiescent level (approximately 6 minutes) stop the recorders.

6.3.12.3.18 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 36 ENTR

6.3.12.4 Test Analysis

6.3.12.4.1 Remove the strip charts from analog recorders.

6.3.12.4.2 Examine each trace carefully to detect any sharp discontinuities of the traces. Disregard all transients less than 0.5 second (5 mm) on any Torque Motor Current signal.

6.3.12.4.3 No Torque Motor Current signal on (GG 2140, GG 2170, GG 2110) shall ever exceed (0.125) amp. Sensitivity on recorder is 20 ma/division for GG 2110, GG 2140 and 36 ma/division for GG 2170.

6.3.12.4.4 Each CDU Fine Error (GG 2220, GG 2280, GG 2250) shall not exceed .070 volts steady state. Disregard transients.

6.3.12.4.5 No CDU Coarse Error (GG 2221, GG 2281, GG 2251) shall ever exceed .680 volts.

6.3.13 **Stabilization Loop Step Response Test**

6.3.13.1 **IG Response Test**

6.3.13.1.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 3 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.13.1.2 On CRT, verify IG MG, and OG gimbal angles are between 358 and 002.

6.3.13.1.3 Set up analog recorder to monitor the following:

MEAS. NO.	SIGNAL NAME
a. OG 2110	IG Torque Motor Current
b. OG 2106	IG Servo Error Total
c. OG 2107	IG Servo Error In Phase
d. OG 2112	IG 1X Resolver Sine
e. OG 2113	IG 1X Resolver Cosine
f. OG 2220	IG CDU Fine Error
g. OG 1201	IMU 28V 1 PCT 800 CPS

6.3.13.1.4 On K-148 initiate FINE ALIGN by entering the following sequence:

VERB 42 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.13.1.5 On the CRT verify CDU X, CDUY Y and CDU Z indicate +00000±00200.

CAUTION: If the transients caused by the subsequent step input do not damp out within 15 seconds, remove IMU Operate Power.

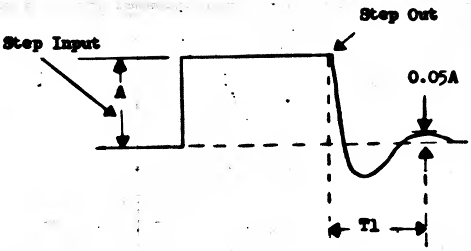
6.3.13.1.6 Enter 1000 into R-START 155.

6.3.13.1.7 Press XEQ/SEAL pushbutton on R-155 to enter the DC step voltage into the IG stabilization loop.

6.3.13.1.8 Prepare to start analog recorder at a chart speed of 100 mm/sec. (IG RESPONSE TEST).

6.3.13.1.9 Enter 0000 into R-START 155. Start analog recorder. Press the XEQ/SEAL pushbutton to remove the step input to the IG stabilization loop.

6.3.13.1.10 After the transient on the recorder has died out, stop the recorder.



TYPICAL STAB LOOP RESPONSE TO STEP INPUT

FIGURE 3

6.3.13.1.11 From the Servo Error In Phase signal recorder trace measure the time interval (T1, Fig. 3) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 3). The period T1, shall not exeed 0.1 second and the trace shall have no more than 3 overshoots.

6.3.13.2 MG Response Test

6.3.13.2.1 Set up analog recorder to monitor the following:

MEAS NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2137	MG Servo Error In Phase
c. GG 2140	MG Torque Motor Current
d. GG 2143	MG 1X Resolver Cosine
e. GG 2250	MG CDU Fine Error
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1ϕ 800 cps

6.3.13.2.2 On the CRT, verify CDU X , CDU Y and CDU Z indicate +00000 (±00200).

CAUTION: If the transients caused by the subsequent step input do not die out within 15 seconds, remove IMU Operate Power.

6.3.13.2.3 Enter 0100 into R-START 155. Press XEQ/SEAL pushbutton R-155 to enter the DC step voltage into the MG stabilization loop.

6.3.13.2.4 Prepare to start analog reocrder at a chart speed of 100 mm/sec. (MG RESPONSE TEST).

6.3.13.2.5 Enter 0000 into R-START 155. Start analog recorder. Press XEQ/SEAL pushbutton to remove the step input to the MG stabilization loop.

6.3.13.2.6 After the transient on the recorder has died out, stop the recorder.

6.3.13.2.7 From the Servo Error In Phase signal recorder trace measure the time interval (T1 Fig. 3) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig 3). The period, T1, shall not exeed 0.1 seconds and the trace shall have no more than 3 overshoots.

6.3.13.3 OG Response Test

6.3.13.3.1 Set up analog recorder to monitor the following:

MEAS NO.	SIGNAL NAME
a. OG 2167	OG Servo Error In Phase
b. OG 2170	OG Torque Motor Current
c. OG 2166	OG Servo Error Total
d. OG 2280	OG CDU Fine Error
e. OG 2172	OG 1X Resolver Sine
f. OG 2173	OG 1X Resolver Cosine
g. OG 1201	IMU 28V 1φ 800 cps

6.3.13.3.2 On the CRT, verify CDU X, CDU Y and CDU Z indicate +00000(±00200).

CAUTION: If the transients caused by the subsequent step input do not die out within 15 seconds, remove IMU operate power.

6.3.13.3.3 Enter 0010 into R-START 155. Press XEQ/SEAL pushbutton on R-155 to enter the DC step voltage into the OG stabilization loop.

6.3.13.3.4 Prepare to start analog recorder at a chart speed of 100 mm/sec. (OG RESPONSE TEST).

6.3.13.3.5 Enter 0000 into R-155. Start analog recorder. Press XEQ/SEAL pushbutton to remove the step input to the OG stabilization loop.

6.3.13.3.6 After the transient on the recorder has died out, stop the recorder.

6.3.13.3.7 From the Servo Error In Phase signal recorder trace, measure the time interval (T1, Fig 3) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 3). The period, T1, shall not exceed 0.1 second and the trace shall have not more than 5 overshoots.

6.3.13.3.8 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.15 AOT Functional Accuracy Test

NOTE: Use of a Dioptometer is required when sighting through AOT.

6.3.15.1 Determination of Detent Angle Reference.

NOTE: The included angles between targets LOS shall be known to ±10 arc seconds. The elevation of each target LOS shall be known to ±15 arc seconds.

6.3.15.1.1 Place AOT in L detent position.

NOTE: Communication between AOT and target theodolite operators is required.

6.3.15.1.2 While viewing through AOT, instruct the target L operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target L, until the target reticle appears in the lower right quadrant of the AOT field of view.

NOTE: The target theodolite base must be level when alignment is achieved.

6.3.15.1.3 Upon alignment, zero the azimuth dial and record the elevation indication of target L as ϕ_1.

6.3.15.1.4 Place AOT in R detent position.

6.3.15.1.5 While viewing through AOT, instruct the target R operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target R, until the target reticle appears in the lower left quadrant of the AOT field of view.

6.3.15.1.6 Rotate the AOT control knob clockwise until the center of the target reticle is superimposed between the double Y reticle. Read and record the target R elevation dial indication, as ϕ_3. Zero the target R azimuth dial. Record AOT dial indication as RY = XXX.XX.

6.3.15.1.7 Rotate the AOT control knob until the center of the target reticle is superimposed between the double SPIRAL lines of AOT reticle. Record AOT dial indication as RS = XXX.XX.

6.3.15.1.8 Collimate L and R targets on each other, record each target azimuth with each target LOS leveled.

Target L az = α_1, Target R az = α_3

6.3.15.1.9 Place the AOT in F detent position.

6.3.15.1.10 Move the R target theodolite to a position in front of the AOT F detent position. (The target shall now be referred to as the F target).

6.3.15.1.11 While viewing through the AOT, instruct the target F operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target reticle appears in the center of the AOT reticle.

6.3.15.1.12 Upon alignment, zero the azimuth dial and record the elevation indication of target F as ϕ_2.

6.3.15.1.13 Collimate L and F targets on each other, record each target azimuth with each target LOS leveled. Target F az = α_2.

6.3.15.1.14 Determine the true azimuth of targets L and F with respect to the AOT. The target azimuth shall be known to within 0.5 arc degrees.

6.3.15.1.15 Rotate the F target in azimuth and elevation to the specified and recorded angles of 6.3.15.1.12.

6.3.15.1.16 Rotate the L target in azimuth and elevation to the specified and recorded angles of 6.3.15.1.13.

6.3.15.1.17 Calculate the values of the included angles between target L and F as X_1 and targets L and R as X_2.

$$X_1 = \cos^{-1}\left\{\sin\phi_1 \sin\phi_2 + \cos\phi_1 \cos\phi_2 \cos\left[180-(\alpha_1+\alpha_2)\right]\right\}$$

$$X_2 = \cos^{-1}\left\{\sin\phi_1 \sin\phi_3 + \cos\phi_1 \cos\phi_3 \cos\left[180-(\alpha_3+\alpha_1)\right]\right\}.$$

Where: α_1 = az value, step 6.3.15.1.8

α_2 = az value, step 6.3.15.1.13

α_3 = az value, step 6.3.15.1.8

6.3.15.2 Computer Loading of Detent Calibration Data

6.3.15.2.1 On K-148 enter:

```
VERB 21   NOUN 03   ENTR
01467               ENTR
XXX.XX              ENTR  (Detent L AZ data)
                    ENTR
01470               ENTR
XXX.XX              ENTR  (Detent F AZ data)
                    ENTR
01471               ENTR
XXX.XX              ENTR  (Detent R AZ data)
                    ENTR
01472               ENTR
XXX.XX              ENTR   (Detent L EL data)
                    ENTR
01473               ENTR
XXX.XX              ENTR  (Detent F EL data)
                    ENTR
```

6.3.15.2.1 (cont)

1474 ENTR
XXX.XX ENTR (Detent R EL data)

6.3.15.3 AOT Measurement of X_1

6.3.15.3.1 On K-148 enter:

VERB 57 ENTR
00012 ENTR
Observe VERB 51 flashing and R1 = 00001 on CRT DSKY display.

6.3.15.3.2 On Computer Control and Reticle Dimming Assembly press MARK X pushbutton. Observe VERB 50 displayed on CRT DSKY display.

6.3.15.3.3 On DSKY press ENTR

Observe VERB 21 NOUN 30 flashing on DSKY

6.3.15.3.4 On DSKY enter:

00000 ENTR
Observe VERB 21 NOUN 43 flashing
00001 ENTR
Observe VERB 21 NOUN 42 flashing

6.3.15.3.5 Set AOT in L detent position.

6.3.15.3.6 Rotate the AOT control knob clockwise until the center of the target reticle is superimposed between the double Y reticle. Read and record LY = XXX.XX.

6.3.15.3.7 Rotate the AOT control knob until the center of the target reticle is superimposed between the double SPIRAL lines of AOT reticle. Record AOT Dial indication as LS XXX.XX.

6.3.15.3.8 On DSKY enter:

±XXX.XX ENTR (LY from 6.3.15.3.6)
Observe VERB 22 NOUN 42 flashing
±XXX.XX ENTR (LS from 6.3.15.3.7)
Observe VERB 51 flashing and R1 = 00002.

6.3.15.3.9 On Computer Control and Reticle Dimming Assembly, press MARK X pushbutton. Observe VERB 50 displayed.

6.3.15.3.10 On DSKY press ENTR
Observe VERB 21, NOUN 30 flashing on DSKY.

6.3.15.3.11 On DSKY enter:

00000 ENTR
Observe VERB 21, NOUN 43 flashing
00002 ENTR
Observe VERB 21, NOUN 42 flashing

6.3.15.3.12 Set AOT in F detent position.

6.3.15.3.13 Rotate AOT control knob clockwise until the center of the target reticle is superimposed between the double Y reticle. Record AOT dial indication as FY = XXX.XX.

6.3.15.3.14 Rotate the AOT control knob until the center of the target reticle is superimposed between the double S reticle lines. Record AOT dial indications as FS = XXX.XX.

6.3.15.3.15 On DSKY enter:

±XXX.XX ENTR (FY from 6.3.15.3.13)
Observe VERB 22 NOUN 42 flashing
±XXX.XX ENTR (FS from 6.3.15.3.14)
Observe VERB 06 NOUN 03, R1 = X1±0.08 degrees.

6.3.15.4 AOT Measurement of X2

6.3.15.4.1 On K-148 enter

VERB 57 ENTR
00012 ENTR
Observe VERB 51 flashing and R1 = 00001 on CRT DSKY display.

6.3.15.4.2 On Computer Control and Reticle Dimming Assembly, press MARK X pushbutton. Observe VERB 50 displayed on CRT DSKY display.

6.3.15.4.3 On DSKY press ENTR. Observe VERB 21 NOUN 30 flashing on DSKY.

6.3.15.4.4 On DSKY enter:

00000 ENTR
Observe VERB 21 NOUN 43 flashing
00001 ENTR
Observe VERB 21 NOUN 42 flashing
±XXX.XX ENTR (LY from 6.3.15.3.6)
Observe VERB 22 NOUN 42 flashing
±XXX.XX ENTR (LS from 6.3.15.3.7)
Observe VERB 51 flashing and R1 = 00002.

6.3.15.4.5 On Computer Control and Reticle Dimming Assembly, press MARK X pushbutton. Observe VERB 50 displayed.

6.3.15.4.6 On DSKY press ENTR. Observe VERB 21, NOUN 30 flashing on DSKY.

6.3.15.4.7 On DSKY enter:

00000 ENTR
Observe VERB 21 NOUN 43 flashing
00002 ENTR
Observe VERB 21 NOUN 42 flashing
±XXX. XX ENTR (RY from 6.3.15.1.6)
Observe VERB 22 NOUN 42 flashing
±XXX. XX ENTR (RS from 6.3.15.1.7)
Observe VERB 06 NOUN 03, R1 = X2±0.08 degrees.

6.3.16 Flight Rope Fixed Memory Bank Sum Check

NOTE: Before proceeding with this test, obtain a Computer Program listing of the flight program being tested. Prepare a list of the bank CKSM bugger words.

6.3.16.1 Verify G&N system in Standby Mode.

6.3.16.2 On K-148 enter the following sequence:

Press ERR RST
VERB 56 ENTR
Observe VERB 05 NOUN 01 flashing

6.3.16.3 Record the CRT DSKY display indications.

Row 1 = AAAAA Bank Sum
Row 2 = 000BB Bank Number
Row 3 = CCCCC (Bank CKSM bugger word)

Row 1 shall be the same as or the complement of the number displayed in Row 2. Row 3 Indication shall be the same as the bugger word recorded above for the bank tested.

6.3.16.4 On K-148 enter VERB 33 ENTR

6.3.16.5 Repeat paragraphs 6.3.16.3 and 6.3.16.4 until all memory bank sums have been checked.

6.3.16.6 On K-148 enter VERB 34 ENTR.

APPENDIX I

MEASUREMENT TOLERANCES

SIGNAL	SIGNAL NAME	G&N LAB TEST REQUIREMENT	PSAAM AND/OR SCA UNCERTAINTY % OF FULL SCALE
GG 1020 link 4*	+14 vdc LGC Supply	14.0±0.4 vdc	0%
GG 1030 link 4	+4 vdc LGC Supply	4.0±0.2 vdc	0%
GG 1040 link 5**	+120 vdc PIPA Supply	120±6.0 vdc	1%
GG 1070 link 4	+4 vdc CDU Supply	4.0±0.2 vdc	0%
GG 1100 link 4	-28 vdc Supply	-27.5±6.0 vdc	0%
GG 1110 link 5	2.5 vdc Telemetry Bias No. 1	2.5±0.1 vdc	0%
GG 1201 link 5	IMU 28V 800 cps 1%	28±0.56V rms	1%
GG 1202 link 4	IMU 28V 800 cps 5%	28±1.4V rms	1.5%
GG 1203 link 4	IMU 28V 800 cps 5%	28±2.1V rms	1.5%
GG 1331 link 5	3.2 kc 28V Supply 1%	28.6±0.56V rms	1%
GG 1500 link 4	+28 vdc IMU Oper BUS	28.0-3.5, +5.5 vdc	0%
GG 1510 link 4	+28 vdc IMU STBY BUS	28.0 -3.5, +5.5 vdc	0%
GG 1513X link 5	+28 vdc IMU STBY/OFF	28.0±1 vdc	0%
GG 1520 link 4	+28 vdc LGC Oper BUS	28.0±4.5 vdc	0%
GG 1523X link 5	+28 vdc LGC Operate	28.0±1 vdc	0%
GG 2001 link 5	X PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
GG 2021 link 5	Y PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
GG 2041 link 5	Z PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
GG 2106 link 4	IG Servo Error Total	0.0±60 MV rms at null	1%
GG 2107 link 5	IG Servo Error IN PH	0.0±60 MV rms at null	2%
GG 2110 link 4	IG Torque Motor Current	0.5 AMP Max during any fine Align Torque	0%
GG 2110 link 5	IG Torque Motor Current	0.5 AMP Max during any fine Align Torque	1%
GG 2112 link 5	IG 1X Resolver Out-Sine	19.65±0.98V rms at 45°	2.5%
GG 2113 link 5	IG 1X Resolver Out-Cosine	19.65±0.98V rms at 45°	2.5%
GG 2121 link 5	IG 1X Resolver Out-Sine 11°	5.35±0.27V rms at 11°	2%
GG 2136 link 4	MG Servo Error Total	0.0±60 MV rms at null	1%
GG 2137 link 5	MG Servo Error IN PH	0.0±60 MV rms at null	2%
GG 2140 link 4	MG Torque Motor Current	0.5 AMP Max during any fine Align Torque	0%
GG 2140 link 5	MG Torque Motor Current	0.5 AMP Max during any fine Align Torque	1%
GG 2142 link 5	MG 1X Resolver Out-Sine	19.65±0.98V rms at 45°	2.5%
GG 2143 link 5	MG 1X Resolver Out-Cosine	19.65±0.98V rms at 45°	2.5%
GG 2151 link 5	MG 1X Resolver Out-Sine 11°	5.35±0.27V rms at 11°	2%
GG 2166 link 4	OG Servo Error Total	0.0±60 MV rms at null	1%
GG 2167 link 5	OG Servo Error IN PH	0.0±60 MV rms at null	2%
GG 2170 link 4	OG Torque Motor Current	0.9 AMP Max during any fine Align Torque	0%
GG 2170 link 5	OG Torque Motor Current	0.9 AMP Max during any fine Align Torque	1%
GG 2172 link 5	OG 1X Resolver Out-Sine	19.65±0.98V rms at 45°	2.5%
GG 2173 link 5	OG 1X Resolver Out-Cosine	19.65±0.98V rms at 45°	2.5%
GG 2181 link 5	OG 1X Resolver Out-Sine 11°	5.35±0.27V rms at 11°	2%
GG 2219 link 5	Pitch Attitude Error	5.05±0.5V rms at 17°	1%
GG 2220 link 4	IG CDU Fine Error	0.0±0.07V rms at null	1%
GG 2221 link 4	IG CDU Coarse Error	0.0±0.68V rms at null	1%

APPENDIX I (Continued)

SIGNAL	SIGNAL NAME	G&N LAB TEST REQUIREMENT	PSAAM AND/OR SCA UNCERTAINTY % OF FULL SCALE
OG 2249 link 5	YAW Attitude Error	5.05±0.5V rms at 17°	1%
OG 2250 link 4	MG CDU Fine Error	0.0±0.07V rms at null	1%
OG 2251 link 4	MG CDU Coarse Error	0.0±0.68V rms at null	1%
OG 2279 link 5	Roll Attitude Error	5.05±0.5V rms at 17°	1%
OG 2280 link 4	OG CDU Fine Error	0.0±0.07V rms at null	1%
OG 2281 link 4	OG CDU Coarse Error	0.0±0.68V rms at null	1%
OG 2300 link 5	PIPA Temperature	130.5 ± 1.5°F in Operate	1%
OG 2301 link 4	IRIG Temperature	135 ± 2.5°F in Operate	1%
OG 2301 link 5	IRIG Temperature	135 ± 2.5°F in Operate	1%
OG 2302 link 4	IMU Heater Current On	28±1 vdc	0%
OG 2303 link 4	IMU Blower Current On	28±1 vdc	0%
OG 3304 link 5	RR Shaft 1X Resolver Out-Sine	19.65±0.98V rms at 45°	2.5%
OG 3305 link 5	RR Shaft 1X Resolver Out-Cosine	19.65±0.98V rms at 45°	2.5%
OG 3311 link 4	RR Shaft CDU Fine Error	0.0±0.07V rms at null	1%
OG 3312 link 4	RR Shaft CDU Coarse Error	0.0±0.68V rms at null	1%
OG 3321 link 4	RR Trunnion CDU Fine Error	0.0±0.07V rms at null	1%
OG 3322 link 4	RR Trunnion CDU Coarse Error	0.0±0.68V rms at null	1%
OG 3324 link 5	RR Trunnion 1X Resolver Out-Sine	19.65±0.98V rms at 45°	2.5%
OG 3325 link 5	RR Trunnion 1X Resolver Out-Cosine	19.65±0.98V rms at 45°	2.5%
OG 4300 link 4	LGC Temperature	87.5±42.5°F	0%
OG 6020 link 4	PIPA Calibration Module Temperature	67.5±22.5°F	0%
OG 6020 link 5	PIPA Calibration Module Temperature	67.5±22.5°F	0%
OG 6021 link 4	PSA Temperature	85±25.0°F	0%
NG 1336 link 4	PHDIFF 3.2KC 28V/LGC SYNC	0° ±10°	3%
NG 1021 link 4	14 VDC LGC Noise RMS	0.4 VRMS Max	0%
NG 1022 link 4	14 VDC LGC Noise Peak	5 volts with rise time of 2 to 5 μsec	0%
NG 1031 link 4	4 VDC LGC Noise RMS	0.4 VRMS Max	0%
NG 1032 link 4	4 VDC LGC Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1071 link 4	4 VDC CDU Noise RMS	1.0 VRMS Max	0%
NG 1072 link 4	4 VDC CDU Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1501 link 4	28 VDC IMU Operate Noise RMS	1.0 VRMS Max	0%
NG 1502 link 4	28 VDC IMU Operate Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1511 link 4	28 VDC IMU Standby Noise RMS	1.0 VRMS Max	0%
NG 1512 link 4	28 VDC IMU Standby Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1521 link 4	28 VDC LGC Operate Noise RMS	2.0 VRMS Max	0%
NG 1522 link 4	28 VDC LGC Operate Noise Peak	5.0 volts with rise time of 2 to 50 μsec	0%

* Link 4 – PSAAM Output Signal
** Link 5 – SCA Output Signal

ADDENDUM I

LM 1 & LM 2

ADDITION 1: The following procedure will be performed for LM 1 and LM 2 only.

6.3.18 Gyrocompassing Test

6.3.18.1 Inertial Instrument Calibration data Load.

6.3.18.1.1 On K-148 enter:

VERB 21	NOUN 01	ENTR
01436		ENTR
XXXXX	(X PIPA BIAS)	ENTR
		ENTR
01437		ENTR
XXXXX	(X PIPA S.F.)	ENTR
		ENTR
01440		ENTR
XXXXX	(Y PIPA BIAS)	ENTR
		ENTR
01441		ENTR
XXXXX	(Y PIPA S.F.)	ENTR
		ENTR
01442		ENTR
XXXXX	(Z PIPA BIAS)	ENTR
		ENTR
01443		ENTR
XXXXX	(Z PIPA S.F.)	ENTR
		ENTR
01444		ENTR
XXXXX	(NBDX)	ENTR
		ENTR
01445		ENTR
XXXXX	(NBDY)	ENTR
		ENTR
01446		ENTR
XXXXX	(NBDZ)	ENTR
		ENTR
01447		ENTR
XXXXX	(ADIAX)	ENTR
		ENTR
01450		ENTR
XXXXX	(ADIAY)	ENTR
		ENTR
01451		ENTR
XXXXX	(ADIZ)	ENTR
		ENTR
01452		ENTR
XXXXX	(ADSRAX)	ENTR
		ENTR

6.3.18.1.1 (cont)

01453	ENTR
XXXXX (ADSRAY)	ENTR
	ENTR
01454	ENTR
XXXXX (ADSRAZ)	ENTR
	ENTR
2506 (ZNBAZ)	ENTR
67777	ENTR
	ENTR
02507	ENTR
77771	ENTR
	ENTR
02510 (LAT)	ENTR
02422	ENTR
	ENTR
02511	ENTR
20416	ENTR

6.3.18.2 Non-Standard Gyrocompassing Position Vector Load

6.3.18.2.1 On K-148 enter:

VERB 21	NOUN 01	ENTR
02720		ENTR
15666		ENTR
		ENTR
02721		ENTR
17272		ENTR
		ENTR
02722		ENTR
73605		ENTR
		ENTR
02723		ENTR
56237		ENTR
		ENTR
02724		ENTR
71156		ENTR
		ENTR
02725		ENTR
54506		ENTR
		ENTR
02726		ENTR
10000		ENTR
		ENTR

6.3.18.2.1 (Continued)	02727	ENTR	
	00000	ENTR	
		ENTR	
	02730	ENTR	
	07257	ENTR	
		ENTR	
	02731	ENTR	
	20033	ENTR	
		ENTR	
	02732	ENTR	
	13600	ENTR	
		ENTR	
	02733	ENTR	
	16506	ENTR	
		ENTR	
	02734	ENTR	
	00000	ENTR	
		ENTR	
	02735	ENTR	
	00000	ENTR	
		ENTR	
	02736	ENTR	
	62334	ENTR	
		ENTR	
	02737	ENTR	
	71216	ENTR	
		ENTR	
	02740	ENTR	
	10365	ENTR	
		ENTR	
	02741	ENTR	
	03117	ENTR	
		ENTR	
	01764	ENTR	GLIFTOFF
	37777	ENTR	POS MAX
		ENTR	
	01765	ENTR	GLIFTOFF+1
	37777	ENTR	POS MAX

6.3.18.3 Gyrocompassing

6.3.18.3.1 On K-148 enter

VERB 57	ENTR
00007	ENTR

6.3.18.3.2 The PROG display changes to 01 for 20 seconds then to 02 for the remainder of Gyrocompassing.

6.3.18.3.3 One hour after PROG light changes to 02 read and record Outer, Inner and Middle gimbal CDU reading from the CRT.

6.3.18.3.4 Deleted.

6.3.18.3.5 Deleted.

6.3.18.3.6 One hour after performing paragraph 6.3.18.3.3 record Outer, Inner and Middle gimbal CDU readings from the CRT.

6.3.18.3.7 The Outer gimbal CDU reading shall be within 1.5° of the value recorded in 6.3.18.3.3. The Inner and Middle gimbal CDU reading shall be within .15° of the value recorded in 6.3.18.3.3.

6.3.18.3.8 On K-148 enter the following:

VERB 36		ENTR
VERB 40	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

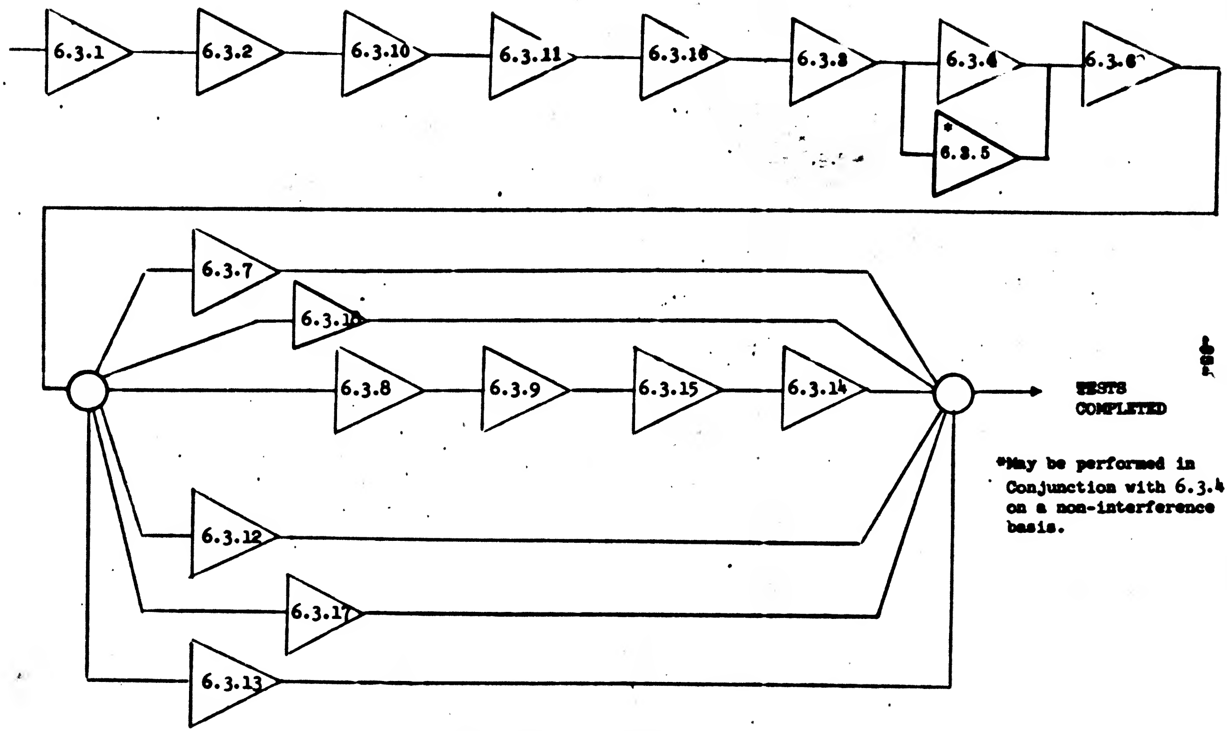
ADDENDUM 1

LM 1 & LM 2

Addition 2: Perform LM 1 and LM 2 test in accordance with the following Flowgram.

Addition 3: Place a note after paragraph 6.3.1.5.2.

NOTE: Before performing the following step insure that the ATCA switch on LEM Panel 16 and the ATCA/PGNCS switch on Panel 11 are in the off position.



*May be performed in
Conjunction with 6.3.4
on a non-interference
basis.

TEST PROCEDURE FLOWGRAM

FIGURE 1

Addition 4:

6.3.17 LGC Clock Alignment Test

6.3.17.1 Verify the following CRT indications:

ACCEPT UPLINK - ON
UP LOCK - OFF
OP ERROR - OFF

6.3.17.2 Set R144 to 00001 and execute observe that CRT indicates TIME ERROR as blank.

6.3.17.3 Set 70 00024 020 into C156 to insert K-FACT Execute.

6.3.17.4 Set 71 00000 000 into C156 to insert TEPOCH. Execute.

6.3.17.5 Obtain Range Time in Hours, Minutes, and Seconds.

6.3.17.6 Add 5 minutes to Range time and record.

6.3.17.6.1 Insert time recorded in 6.3.17.6 as 90 XX (HRS) XX (MINS) XX (SECS) into C156. Execute.

6.3.17.7 Insert time recorded in 6.3.17.6 (LGC preset time) as 91+XXX (HRS) XX (MINS) XX (SECS). Execute.

6.3.17.8 Before Range Time +5 minutes occurs, set 0001 into R152. Execute.

6.3.17.9 Verify that CRT indication of TIME ERROR is blank.

NOTE: If TIME ERROR 1 is present, repeat all preceding steps of LGC Clock Alignment.

6.3.17.10 Wait until range time in 6.3.17.6 has passed.

6.3.17.11 Set R152 to 0010. Execute. Record CRT indication of DELTA TIME. Verify that CRT indication of TIME ERROR is blank.

6.3.17.12 Deleted.

6.3.17.13 Set R152 to 0100. Execute. Verify that CRT indication of TIME ERROR is blank.

6.3.17.14 Deleted.

6.3.17.15 Set R152 to 0010. Execute. Record CRT indication of DELTA TIME. DELTA TIME shall be 000.00 (sec) ±0.01 sec.

6.3.17.16 Deleted.

ADDENDUM II RR CDU TESTING

LM 3 & Subsequent

ADDITION 1: RR CDU testing requires that the Rendezvous Radar is operating. The Rendezvous Radar is not activated until Integrated testing. To insure that the RR CDU's are operating properly the minimum requirements for RR CDU testing are presented here so that they may be included as part of the requirements to be demonstrated at the first opportunity after Rendezvous Radar activation.

6.3.19 RR/CDU Control

6.3.19.1 Command Accuracy 240.00°

6.3.19.1.1 On K-148 enter the following:

VERB 36		ENTR
VERB 41	NOUN 40	ENTR
+24000		ENTR
+24000		ENTR
VERB 34		ENTR

The CRT RR CDU Trunnion and Shaft angle indications shall be 240.00 ±000.30°.

6.3.19.2 CDU Fine and CDU Coarse Error

6.3.19.2.1 Set up analog recorder to monitor the following:

Meas No.	Signal Name
a. GG 3311	Shaft CDU Fine Error
b. GG 3312	Shaft CDU Coarse Error
c. GG 3321	Trunnion CDU Coarse Error
d. GG 3322	Trunnion CDU Coarse Error

6.3.19.2.2 On K-148 enter the following:

VERB 36		ENTR
VERB 41	NOUN 40	ENTR
+04500		ENTR
+04500		ENTR
VERB 34		ENTR

6.3.19.2.3 Verify the following signals on the CRT.

RR Shaft 1X Sine (GG 3304)	18.4±1.84 VRMS
RR Shaft 1X Cos (GG 3305)	18.4±1.84 VRMS
RR Trunnion 1X Sine (GG 3324)	18.4±1.84 VRMS
RR Trunnion 1X Cos (GG 3325)	18.4±1.84 VRMS

6.3.19.2.4 Verify that no CDU Fine Error (GG 3311, GG 3321) exceeds 0.70 volts.

6.3.19.2.5 Verify that no CDU Coarse Error (GG 3312, GG 3322) exceeds .680 volts.

6.3.19.3 RR CDU Fail

6.3.19.3.1 On K-148 enter the following:

VERB 36		ENTR
VERB 41	NOUN 40	ENTR
+00100		ENTR
+00000		ENTR
VERB 34		ENTR
VERB 21	NOUN 10	ENTR
00012		ENTR
00001		ENTR

Verify RR CDU Fail comes ON in approximately 10 seconds.

6.3.19.3.2 On K-148 enter the following:

Press ERR RST

VERB 36		ENTR
VERB 41	NOUN 40	ENTR
+00000		ENTR
+00100		ENTR
VERB 34		ENTR
VERB 21	NOUN 10	ENTR
00012		ENTR
00001		ENTR

Verify RR CDU Fail comes ON in approximately 10 seconds.

6.3.19.3.3 On K-148 enter the following:

Press ERR RST		
VERB 36		ENTR
VERB 41	NOUN 40	ENTR
+03375		ENTR
+00000		ENTR
VERB 34		ENTR
VERB 21	NOUN 10	ENTR
00012		ENTR
00001		ENTR

Verify RR CDU Fail comes ON in approximately 10 seconds.

6.3.19.3.4 On K-148 enter the following:

Press ERR RST		
VERB 36		ENTR
VERB 41	NOUN 40	ENTR
+00000		ENTR
+03375		ENTR
VERB 34		ENTR
VERB 21	NOUN 10	ENTR
00012		ENTR
00001		ENTR

Verify RR CDU Fail comes ON in approximately 10 seconds.

6.3.19.3.5 On K-148 enter the following:

Pres ERR RST		
VERB 36		ENTR
VERB 41	NOUN 40	ENTR
+00000		ENTR
+00000		ENTR
VERB 34		ENTR

ADDENDUM III

DANCE G&N System Tests

Addition 1: Add new paragraph 5.6.1.3 when DANCE flight ropes are installed in the S/C.

5.6.1.3 The DANCE program does not automatically display computer error codes when a PROG alarm occurs. If error code is desired enter the following on K-148:

VERB 05 NOUN 09 ENTR

Error code will appear in R1.
Address if failure +1 appears in R2.
Number of fails appears in R3.

Addition 2: Substitute this paragraph for paragraph 6.2.2.4.1 when DANCE flight ropes are installed in the S/C.

6.2.2.4.1 On K-148 enter the following:

VERB 21	NOUN 01	ENTR
00760		ENTR
00000		ENTR

Verify that NO ATT and GIMBAL LOCK lamp indications are OFF.

Addition 3: The following procedure replaces paragraph 6.3.6 when DANCE ropes are installed in the S/C.

NOTE: Manual DSKY entries during this test may result in a test abort.

6.3.6 IMU Operational Test.

6.3.6.1 Verify K-START tape F07L002-K105XX-00 LM G/N OPCHK is on K-START tape reader.

6.3.6.2 E-Memory Program Load.

6.3.6.2.1 Start tape reader.

6.3.6.2.2 When tape reader stops verify that CRT DSKY Row 1 and Row 2 indicate the same numbers.

6.3.6.2.3 Repeat above two steps X times.

6.3.6.3 Local g measurement.

6.3.6.3.1 Start tape reader.

6.3.6.3.2 In approximately 15 minutes VERB 06 NOUN 66 shall flash.

6.3.6.3.3 From the CRT DSKY display read and record Row 1 and Row 2 (local gravity whole and fractional respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.3.6.4 Horizontal earth rate measurement.

6.3.6.4.1 Start tape reader.

6.3.6.4.2 VERB 06 NOUN 66 shall flash.

6.3.6.4.3 From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y, and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.3.6.5 Enter the following on K-148:

VERB 36		ENTR
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

Addition 4: The following procedure replaces paragraph 6.3.7 when DANCE ropes are installed in the S/C.

6.3.7 Semi-Automatic Mode Test.

6.3.7.1 Verify K-START tape F07L002-K105XX-00 LEM Semi-Automatic Mode Test is on K-START tape reader.

6.3.7.2 E-Memory Program Load.

6.3.7.2.1 Start tape reader.

6.3.7.2.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.3.7.2.3 On K-148 enter the following:

VERB 01 NOUN 01 ENTR
01257 ENTR
Record contents of Row 1 XXXXY
VERB 21 NOUN 01 ENTR
01257 ENTR
XXXXY' ENTR
Where Y' is obtained from Table II of section 6.3.9.

6.3.7.3 E-Bank Sum Check.

6.3.7.3.1 Start tape reader.

6.3.7.3.2 When tape reader stops verify that CRT DSKY Row 1 and Row 2 indicate the same numbers.

6.3.7.3.3 Repeat above two steps X times.

6.3.7.4 Command Accuracy 0°.

6.3.7.4.1 Start tape reader.

6.3.7.4.2 When tape stops verify that CRT DSKY Row 1 indicates +00002. Wait 15 seconds.

6.3.7.4.3 Read and record CRT IMU Gimbal angles. The indications shall be 000 ± 001 degrees.

6.3.7.4.4 Read and record CRT CDU angle indications. Indications shall be +000.00±000.30.

6.3.7.5 Command Accuracy 45°.

6.3.7.5.1 Start tape reader.

6.3.7.5.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00003. Wait 15 seconds.

6.3.7.5.3 Read and record CRT IMU Gimbal angles. The indications shall be 045 ± 001 degrees.

6.3.7.5.4 Read and record CRT CDU angle indications. Indications shall be +045.00 ± 000.30.

6.3.7.6 CDU Repeating Accuracy 45°.

6.3.7.6.1 Start tape reader.

6.3.7.6.2 Approximately 95 seconds after tape reader stops VERB 06 NOUN 02 will flash. Verify CRT DSKY Row 1 indicates +00004.

6.3.7.6.3 Start tape reader.

6.3.7.6.4 When tape reader stops read and record CRT DSKY Rows 1, 2, and 3 indications. Indications shall be between 77774 and 00003.

6.3.7.7 Command Accuracy 90°

6.3.7.7.1 Start tape reader.

6.3.7.7.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00005. Gimbal Lock lamp will be lighted. Wait 15 seconds.

6.3.7.7.3 Read and record CRT indication of IMU Gimbal angles. The indications shall be 090 ± 001 degrees.

6.3.7.7.4 Read and record CRT CDU angle indications. Indication shall be +090.00 ± 000.30.

6.3.7.8 Command Accuracy 135°.

6.3.7.8.1 Start tape reader.

6.3.7.8.2 When tape reader stops verify CRT DSKY Row 1 indicates +00006. Wait 15 seconds.

6.3.7.8.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 135 ± 001 degrees.

6.3.7.8.4 Read and record CRT CDU angle indications. Indications shall be +135.00 ± 000.30.

6.3.7.9 CDU Repeating Accuracy 135°.

6.3.7.9.1 Start tape reader.

6.3.7.9.2 When tape reader stops verify CRT DSKY Row 1 indicates +00007. Wait 10 seconds, verify Gimbal Lock lamp on DSKY is not lighted.

6.3.7.9.3 Start tape reader.

6.3.7.9.4 Approximately 95 seconds after tape reader stops VERB 06 NOUN 02 will flash. Verify CRT DSky Row 1 indicates +00008.

6.3.7.9.5 Start tape reader.

6.3.7.9.6 When tape reader stops read and record CRT DSKY Rows 1, 2, and 3 indications. Indications shall be between 77774 and 00003.

6.3.7.10 Plus Gimbal Lock Test.

6.3.7.10.1 Start tape reader.

6.3.7.10.2 When tape reader stops wait approximately 10 seconds. Verify CRT DSKY Row 1 indicates +00009. Verify Gimbal Lock lamp is lighted.

6.3.7.11 Command Accuracy 225°.

6.3.7.11.1 Start tape reader.

6.3.7.11.2 When tape reader stops verify CRT DSKY Row 1 indicates +00010. Gimbal Lock lamp will be lighted. Wait 15 seconds.

6.3.7.11.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 225 ± 001 degrees.

6.3.7.11.4 Read and record CRT CDU angle indications. Indications shall be +225.00 ± 000.30.

6.3.7.12 CDU Command Rate Test.

6.3.7.12.1 Middle Gimbal Rate Test.

6.3.7.12.1.2 When tape reader stops verify CRT DSKY Row 1 indicates +00011. Verify Gimbal Lock lamp is not lighted. Wait 25 seconds before proceeding.

6.3.7.12.1.3 Start tape reader.

6.3.7.12.1.4 Approximately 25 seconds after tape reader stops VERB 06 NOUN 02 will flash. Verify CRT DSKY Row 1 indicates +00012. Gimbal Lock lamp will be lighted.

6.3.7.12.1.5 Start tape reader.

6.3.7.12.1.6 When tape reader stops read and record CRT DSKY Row 1 indication. This is whole part of middle gimbal torque rate.

6.3.7.12.1.7 Start tape reader.

6.3.7.12.1.8 When tape reader stops read and record CRT DSKY Row 1 indications. This is fractional part of middle gimbal torque rate.

6.3.7.12.1.8.1 The middle gimbal torque rate shall be between 00012.00000 and 00016.00000.

6.3.7.12.2 Inner Gimbal Rate Test.

6.3.7.12.2.1 Start tape reader.

6.3.7.12.2.2 VERB 30 NOUN 26 will flash approximately 25 seconds after tape reader stops.

6.3.7.12.2.3 Start tape reader.

6.3.7.12.2.4 When tape reader stops read and record CRT DSKY Row 1 indication. This is whole part of inner gimbal torque rate.

6.3.7.12.2.5 Start tape reader.

6.3.7.12.2.6 When tape reader stops read and record CRT DSKY Row 1 indication. This is fractional part of inner gimbal torque rate.

6.3.7.12.2.7 The inner gimbal torque rate shall be between 00012.00000 and 00016.00000.

6.3.7.12.3 Outer Gimbal Rate Test.

6.3.7.12.3.1 Start tape reader.

6.3.7.12.3.2 VERB 30 NOUN 26 will flash approximately 25 seconds after tape reader stops.

6.3.7.12.3.3 Start tape reader.

6.3.7.12.3.4 When tape reader stops read and record CRT DSKY Row 1 indication. This is whole part of outer gimbal torque rate.

6.3.7.12.3.5 Start tape reader.

6.3.7.12.3.6 When tape reader stops read and record CRT DSKY Row 1 indication. This is fractional part of outer gimbal torque rate.

6.3.7.12.3.7 The outer gimbal torque rate shall be between 00012.00000 and 00016.00000.

6.3.7.13 Command Accuracy 315°.

6.3.7.13.1 Start tape reader.

6.3.7.13.2 When tape reader stops verify CRT DSKY Row 1 indicates +00013.

6.3.7.13.3 Read and record CRT IMU Gimbal angles. Indication shall be 315 ± 001 degrees.

6.3.7.13.4 Read and record CRT CDU angle indications. Indications shall be +315.00 ± 000.30.

6.3.7.14 CDU Repeating Accuracy 315°.

6.3.7.14.1 Start tape reader.

6.3.7.14.2 Approximately 95 seconds after tape reader stops VERB 06 NOUN 02 will flash. Verify CRT DSKY Row 1 indicates +00014.

6.3.7.14.3 Start tape reader.

6.3.7.14.4 When tape reader stops read and record CRT DSKY Rows 1, 2, and 3 indications. Indications shall be between 77774 and 00003.

6.3.7.15 Minus Gimbal Lock Test.

6.3.7.15.1 Start tape reader.

6.3.7.15.2 When tape reader stops verify CRT DSKY Row 1 indicates +00015. Verify Gimbal Lock lamp is lighted.

6.3.7.16 CDU Repeating Accuracy 225°.

6.3.7.16.1 Start tape reader.

6.3.7.16.2 When tape reader stops verify CRT DSKY Row 1 indicates +00016. Wait 15 secs. before continuing.

6.3.7.16.3 Start tape reader.

6.3.7.16.4 Approximately 95 seconds after tape reader stops VERB 30 NOUN 26 will flash.

6.3.7.16.5 Start tape reader.

6.3.7.16.6 When tape reader stops read and record CRT DSKY Rows 1, 2, and 3 indications. Indications shall be between 77774 and 00003.

6.3.7.17 OG CDU Fine Fail Test

6.3.7.17.1 Start Tape reader.

6.3.7.17.2 When tape reader stops verify CRT DSKY Row 1 indicates 00021 and Row 2 indicates 27XXX. The NO ATT lamp is lighted.

6.3.7.17.3 Start tape reader.

6.3.7.17.4 Approximately 45 secs after tape reader stops verify VERB/NOUN lights are flashing. ISS Warning lamp will be lighted.

6.3.7.17.5 Start tape reader.

6.3.7.17.6 When tape reader stops verify CRT DSKY Row 1 displays 00021 and Row 2 displays 33XXX. ISS Warning goes out approximately 4 seconds after tape stops.

6.3.7.18 IG CDU Fine Fail Test.

6.3.7.18.1 Start tape reader.

6.3.7.18.2 When tape reader stops verify CRT DSKY Row 1 indicates 00022 and Row 2 indicates 27XXX. The NO ATT lamp is lighted.

6.3.7.18.3 Start tape reader.

6.3.7.18.4 Approximately 45 seconds after tape reader stops verify VERB/NOUN lights are flashing. ISS Warning lamp will be lighted.

6.3.7.18.5 Start tape reader.

6.3.7.18.6 When tape reader stops verify CRT DSKY Row 1 displays 00022 and Row 2 displays 33XXX. ISS Warning goes out approximately 4 seconds after tape stops.

6.3.7.19 MG CDU Fine Fail Test.

6.3.7.19.1 Start tape reader.

6.3.7.19.2 When tape reader stops verify CRT DSKY Row 1 indicates 00023 and Row 2 indicates 27XXX. The NO ATT lamp is lighted.

6.3.7.19.3 Start tape reader.

6.3.7.19.4 Approximately 45 seconds after tape reader stops verify VERB/NOUN lights are flashing. ISS Warning lamp will be lighted.

6.3.7.19.5 Start tape reader.

6.3.7.19.6 When tape reader stops verify CRT DSKY Row 1 displays 00023 and Row 2 displays 33XXX. ISS Warning goes out approximately 4 seconds after tape stops.

6.3.7.20 OG CDU Coarse Fail Test.

6.3.7.20.1 Start tape readers.

6.3.7.20.2 When tape reader stops verify CRT DSKY Row 1 indicates 00024 and Row 2 indicates 27XXX. The NO ATT lamp is lighted.

6.3.7.20.3 Start tape reader.

6.3.7.20.4 Approximately 45 seconds after the tape reader stops verify VERB/NOUN lights are flashing. ISS Warning lamp will be lighted.

6.3.7.20.5 Start tape reader.

6.3.7.20.6 When tape reader stops verify CRT DSKY Row 1 displays 00024 and Row 2 displays 33XXX. ISS Warning goes out approximately 4 seconds after tape stops.

6.3.7.21 IG CDU Coarse Fail Test.

6.3.7.21.1 Start tape reader.

6.3.7.21.2 When tape reader stops verify CRT DSKY Row 1 indicates 00025 and Row 2 indicates 27XXX. The NO ATT lamp is lighted.

6.3.7.21.3 Start tape reader.

6.3.7.21.4 Approximately 45 seconds after the tape reader stops verify VERB/NOUN lights are flashing. ISS Warning lamp will be lighted.

6.3.7.21.5 Start tape reader.

6.3.7.21.6 When tape reader stops verify CRT DSKY Row 1 displays 00025 and Row 2 displays 33XXX. ISS Warning goes out approximately 4 seconds after tape stops.

6.3.7.22 MG CDU Coarse Fail Test.

6.3.7.22.1 Start tape reader.

6.3.7.22.2 When tape reader stops verify CRT DSKY Row 1 indicates 00026 and Row 2 indicates 27XXX. The NO ATT lamp is lighted.

6.3.7.22.3 Start tape reader.

6.3.7.22.4 Approximately 45 seconds after the tape reader stops verify VERB/NOUN lights are flashing. ISS Warning lamp will be lighted.

6.3.7.22.5 Start tape reader.

6.3.7.22.6 When tape reader stops verify CRT DSKY Row 1 displays 00026 and Row 2 displays 33XXX. ISS Warning goes out approximately 4 seconds after tape stops.

6.3.7.23 FDAI Linearity Test.

6.3.7.23.1 Start tape reader.

6.3.7.23.2 On CRT verify the following:

CRT DSKY Row 1 indicates +00385.
PITCH ATT ERROR is between +15.3 and +18.7 DEG (GG 2219)
YAW ATT ERROR is between +15.3 and +18.7 DEG (GG 2249)
ROLL ATT ERROR is between +15.3 and +18.7 DEG (GG 2279)

6.3.7.23.3 Start tape reader.

6.3.7.23.4 On CRT verify the following:

CRT DSKY Row 1 indicates +00364.
PITCH ATT ERROR is between +14.4 and +17.6 DEG (GG 2219)
YAW ATT ERROR is between +14.4 and +17.6 DEG (GG 2249)
ROLL ATT ERROR is between +14.4 and +17.6 DEG (GG 2279)

6.3.7.23.5 Start tape reader.

6.3.7.23.6 On CRT verify the following:

CRT DSKY Row 1 indicates +00136.
PITCH ATT ERROR is between +05.4 and +06.6 DEG (GG 2219)
YAW ATT ERROR is between +05.4 and +06.6 DEG (GG 2249)
ROLL ATT ERROR is between +05.4 and +06.6 DEG (GG 2279)

6.3.7.23.7 Start tape reader.

6.3.7.23.8 On CRT verify the following:

CRT DSKY Row 1 indicates +00000.
PITCH ATT ERROR is between +00.2 and -00.2 DEG (GG 2219)
YAW ATT ERROR is between +00.2 and -00.2 DEG (GG 2249)
ROLL ATT ERROR is between +00.2 and -00.2 DEG (GG 2279)

6.3.7.23.9 Start tape reader.

6.3.7.23.10 On CRT verify the following:

CRT DSKY Row 1 indicates -00136.
PITCH ATT ERROR is between -05.4 and -06.6 DEG (GG 2219)
YAW ATT ERROR is between -05.4 and -06.6 DEG (GG 2249)
ROLL ATT ERROR is between -05.4 and -06.6 DEG (GG 2279)

6.3.7.23.11 Start tape reader.

6.3.7.23.12 On CRT verify the following:

CRT DSKY Row 1 indicates -00364.
PITCH ATT ERROR is between -14.4 and -17.6 DEG (GG 2219)
YAW ATT ERROR is between -14.4 and -17.6 DEG (GG 2249)
ROLL ATT ERROR is between -14.4 and -17.6 DEG (GG 2279)

6.3.7.23.13 Start tape reader.

6.3.7.23.14 On CRT verify the following:

CRT DSKY Row 1 indicates -00385.
PITCH ATT ERROR is between -15.3 and -18.7 DEG (GG 2219)
YAW ATT ERROR is between -15.3 and -18.7 DEG (GG 2249)
ROLL ATT ERROR is between -15.3 and -18.7 DEG (GG 2279)

6.3.7.24 On K-148 enter VERB 36 ENTR

The proper operation of the IMU CAGE function (consisting of steps 6.3.7.24.1 thru 6.3.7.24.7) need be performed only once during the initial PGNCS Operational Test and omitted from subsequent testing of test 6.3.7.

6.3.7.24.1 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00500 ENTR
+00500 ENTR
+00500 ENTR

6.3.7.24.2 On the CRT, verify all IMU gimbal angles indicate between 003 and 007 deg.

6.3.7.24.3 On analog recorder, monitor the following signals:

SIGNAL NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2106	IG Servo Error Total
c. GG 2166	OG Servo Error Total
d. GG 2112	IG 1X Resolver Sine
e. GG 2172	OG 1X Resolver Sine
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1% 800 cps

6.3.7.24.4 Start analog recorder to a chart speed of 5 mm/sec.

6.3.7.24.5 On LEM Cabin Panel 4, hold IMU CAGE momentary toggle switch in the ON position. (Do not release.)

6.3.7.24.6 On analog recorder, verify the 1X Resolver Sine signals (GG 2112, GG 2172, GG 2142) null out to less than 0.5 VRMS. Release IMU CAGE switch to the OFF position. Disregard any momentary transients on the 1X Resolver Sine signals when the switch is released. Any sustained oscillations shall be cause for immediate removal of IMU Operate power.

6.3.7.24.7 On the CRT, verify all IMU gimbal angles indicate between 359 and 001.

6.3.7.25 Stop analog recorder.

6.3.7.25.1 On K-148 enter the following:

VERB 36	ENTR
VERB 43	ENTR
+01700	ENTR
+00600	ENTR
-01700	ENTR

On CRT verify the following:
YAR ATT ERROR is between +15.3 and 18.7 DEG (GG 2249)
PITCH ATT ERROR is between +05.5 and 06.6 DEG (GG 2219)
ROLL ATT ERROR is between -15.3 and -18.7 DEG)GG 2279)

6.3.7.26 On K-148 enter the following sequence:

VERB 36		ENTR
VERB 41	NOUN 20	ENTR
+00800		ENTR
+00100		ENTR
-00800		ENTR

6.3.7.27 On CRT verify the following:

IG 1X Resolver Sin (11°) is between +06.5 and +09.6 DEG (GG 2121)
MG 1X Resolver Sin (11°) is between +00.5 and +02.5 DEG (GG 2151)
OG 1X Resolver Sin (11°) is between -06.5 and -09.5 DEG (GG 2181)

6.3.7.28 On K-148 enter the following:

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

Addition 5: The following procedure replaces paragraph 6.3.8 when DANCE flight ropes are installed in the S/C.

6.3.8 IRIG Scale Factor Test.

6.3.8.1 Verify K-START tape F07L003-K00XXX-00 LM IRIG Scale Factor Test is on the K-START tape reader.

6.3.8.2 On K-148 enter the following:

```
VERB 36                 ENTR
```

6.3.8.3 E-Memory Program Load.

6.3.8.3.1 Start tape reader.

6.3.8.3.2 When tape reader stops verify that CRT DSKY Row 1 indicates 77777.

6.3.8.4 Test Position data load (+X S.F.).

6.3.8.4.1 Start tape reader.

6.3.8.4.2 When tape reader stops verify that CRT DSKY Row 1 displays indicates +00001.

6.3.8.4.3 On K-148 enter the following:

```
VERB 25    NOUN 26    ENTR
04000                 ENTR
XXXXX (STARTING ADDRESS) ENTR
YYYYY      BBANK      ENTR
VERB 30               ENTR
```

6.3.8.5 Test Position Data Load (+Y S.F.).

6.3.8.5.1 Start tape reader.

6.3.8.5.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.3.8.5.3 On K-148 enter the following:

VERB 25 NOUN 26 ENTR
04000 ENTR
XXXXX (STARTING ADDRESS) ENTR
YYYYY BBANK ENTR
VERB 30 ENTR

6.3.8.5.4 When VERB 06 NOUN 41 flashes verify the following on the CRT DSKY display:

R2 = XX.XXX Site Latitude (See Table 1)
R3 = XXX.XX NAV BASE AZIMUTH

If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

If R3 requires correction enter VERB 23 ENTR into K-148 and enter correct azimuth.

6.3.8.5.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.5.6 In approximately 200 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002).

6.3.8.6 Test Position data load (+Z S.F.).

6.3.8.6.1 Start tape reader.

6.3.8.6.2 When tape reader stops verify that CRT DSKY Row 1 displays indicates +00003.

6.3.8.6.3 On K-148 enter the following:

VERB 25 NOUN 26 ENTR
04000 ENTR
XXXXX (STARTING ADDRESS) ENTR
YYYYY BBANK ENTR
VERB 30 ENTR

6.3.8.6.4 When VERB 06 NOUN 41 flashes verify the following on the CRT DSKY display.

R2 = XX.XXX Site Latitude (See Table 1)
R3 = XXX.XX NAV . BASE AZIMUTH

If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

If R3 requires correction enter VERB 23 ENTR into K-148 and enter correct azimuth.

6.3.8.6.5 On K-148 enter the following:

VERB 33	ENTR

6.3.8.6.6 In approximately 200 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG Scale Factor error in parts per million. Position +00003.)

6.3.8.7 Test Position data load (-X S. F.).

6.3.8.7.1 Start tape reader.

6.3.8.7.2 When tape reader stops verify that CRT DSKY Row 1 displays indicate -00001.

6.3.8.7.3 On K-148 enter the following:

VERB 25	NOUN 26	ENTR
04000		ENTR
XXXXX	(STARTING ADDRESS)	ENTR
YYYYY	BBANK	ENTR
VERB 30		ENTR

6.3.8.7.4 When VERB 06 NOUN 41 flashes verify the following on the CRT DSKY display:

R2 = XX.XXX Site Latitude (See Table 1)
R3 = XXX.XX NAV BASE AZIMUTH

If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

If R3 requires correction enter VERB 23 ENTR into K-148 and enter correct azimuth.

6.3.8.7.5 On K-148 enter the following:

VERB 33	ENTR

6.3.8.7.6 In approximately 200 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG Scale Factor error in parts per million. Position -00001.)

6.3.8.8 Test Position data load (-Y S.F.).

6.3.8.8.1 Start tape reader.

6.3.8.8.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.3.8.8.3 On K-148 enter the following:

VERB 25	NOUN 26	ENTR
04000		ENTR
XXXXX	(STARTING ADDRESS)	ENTR
YYYYY	BBANK	ENTR
VERB 30		ENTR

6.3.8.8.4 When VERB 06 NOUN 41 flashes verify the following on the CRT DSKY display.

R2 = XX.XXX Site Latitude (see Table 1)
R3 = XXX.XX NAV BASE AZIMUTH

If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

If R3 requires correction enter VERB 23 ENTR into K-148 and enter correct azimuth.

6.3.8.8.5 On K-148 enter the following:

VERB 33	ENTR

6.3.8.8.6 In approximately 200 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG Scale Factor error in parts per million. Position -00002.)

6.3.8.9 Test Position data load (-Z S.F.).

6.3.8.9.1 Start tape reader.

6.3.8.9.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.3.8.9.3 On K-148 enter the following:

VERB 25	NOUN 26	ENTR
04000		ENTR
XXXXX	(STARTING ADDRESS)	ENTR
YYYYY	BBANK	ENTR
VERB 30		ENTR

6.3.8.9.4 When VERB 06 NOUN 41 flashes verify the following on the CRT DSKY display.

R2 = XX.XXX Site Latitude (See Table 1)
R3 = XXX.XX NAV BASE AZIMUTH

If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

If R3 requires correction enter VERB 23 ENTR into K-148 and enter correct azimuth.

6.3.8.9.5 In approximately 200 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG Scale Factor error in parts per million. Position -00003).

6.3.8.10 Terminate this test by entering the following into K-148:

VERB 36		ENTR
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

6.3.8.11 The Scale Factor Error for each of the 6 positions shall be 0±1750 PPM.

Addition 6: The following procedure replaces paragraph 6.3.9 when DANCE flight ropes are installed in the S/C.

6.3.9 IMU Performance test. A reference data sheet is provided at the end of this section to aid in data reduction.

6.3.9.1 Insure that IMU Operate power and LGC Operate power has been supplied for a minimum of one hour and that the IMU is not in a Gimbal Lock condition.

6.3.9.2 On CRT, monitor and record IRIG TEMP (GG 2301) and PIPA TEMP (GG 2300).

6.3.9.3 On K-148 enter the following:

```
VERB 01   NOUN 10   ENTR
00003               ENTR
```

Record CRT DSKY Row 1 indication AAAAA and the time of day.

6.3.9.4 On K-148 enter the following:

```
VERB 21   NOUN 01   ENTR
03377               ENTR
AAAAA               ENTR
VERB 06   NOUN 02   ENTR
03377               ENTR
```

Record CRT DSKY Row 1 indications as ±BBBBB.

6.3.9.9 Position 1 Stable Member Matrix Load.

6.3.9.9.1 Start tape reader.

6.3.9.9.2 When tape reader stops enter the following in K-148:

VERB 92 ENTR
00001 ENTR

6.3.9.9.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation base azimuth ±0.50 deg.)
+28.516 ENTR (Correct test site latitude)
Verify values in R1 and R2 are correct.

6.3.9.9.4 Enter the following on K-148:

VERB 33 ENTR

6.3.9.9.5 In approximately 12 minutes, VERB 06 NOUN 98 shall flash. From the CRT, DSKY display, record R2 [+NBDY (position +00001)] .

6.3.9.9.6 Enter the following on K-148:

VERB 33 ENTR

6.3.9.9.7 In approximately 6 minutes, VERB 06 NOUN 98 shall flash. From the CRT DSKY, record R1 and R2 [+X PIPA 1g (position +00001)] . Row 1 is whole part, Row 2 is fractional part.

6.3.9.9.8 Enter the following on K-148:

VERB 36 ENTR

6.3.9.10 Position 2 Stable Member Matrix Load.

6.3.9.10.1 Start tape reader.

6.3.9.10.2 When tape reader stops enter the following on K-148:

VERB 92 ENTR
00001 ENTR

6.3.9.5 Perform the following calculations:

a. $\frac{\text{BBBBB} \times 5.12}{3600}$ = CCCC.C (Contents (hrs) of high order scaler register)

b. 23.3 − CCCC.C = DDDD.D hours.

c. DDDD.D + present time of day = time of day at which high order scalar register will overflow.

6.3.9.6 If the time of day is within 12 minutes of that calculated in 6.3.9.5.c when about to perform any of the following paragraphs, wait until that time calculated in 6.3.9.5.c has passed and proceed.

a. 6.3.9.9.6
b. 6.3.9.10.6
c. 6.3.9.11.6
d. 6.3.9.12.6
e. 6.3.9.13.4
f. 6.3.9.14.4

6.3.9.7 On K-148 enter the following sequence:

VERB 01	NOUN 01	ENTR
01257		ENTR

Record contents of Row 1 XXXXY

VERB 21	NOUN 01	ENTR
01257		ENTR
XXXXY'		ENTR

Where Y' is obtained from Table II.

6.3.9.8 E-Memory Load.

6.3.9.8.1 Start tape reader.

6.3.9.8.2 When tape reader stops enter the following on K-148:

VERB 05	NOUN 01	ENTR
02239		ENTR

6.3.9.8.3 Verify CRT DSKY display the following:

Row 1	00033
Row 2	00000
Row 3	00000

6.3.9.10.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation azimuth ±0.5 deg)
+28.516 ENTR (Correct test site latitude)
Verify values in R1 and R2 are correct.

6.3.9.10.4 Enter the following on K-148:

VERB 33 ENTR

6.3.9.10.5 In approximately 12 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY display record R2 [+NBDZ (position +00002)].

6.3.9.10.6 Enter the following on K-148:

VERB 33 ENTR

6.3.9.10.7 In approximately 6 minutes, VERB 06 NOUN 98 shall flash. From the CRT DSKY record R1 and R2 [-X PIPA 1g (Position +00002)]. Row 1 is whole part, Row 2 is fractional part.

6.3.9.10.8 Enter the following on K-148:

VERB 33 ENTR

6.3.9.10.9 In approximately 67 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY record R2 [-NBDX + ADIAX (position +00002)].

6.3.9.10.10 Enter the following on K-148:

VERB 36 ENTR

6.3.9.11 Position 3 Stable Member Matrix Load.

6.3.9.11.1 Start tape reader.

6.3.9.11.2 When tape reader stops enter the following on K-148:

VERB 92 ENTR
00001 ENTR

6.3.9.11.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation base azimuth ±0.5 deg.)
+28.516 ENTR (Correct test site latitude)
Verify values in R1 and R2 are correct.

6.3.9.11.4 Enter the following on K-148:

VERB 33	ENTR

6.3.9.11.5 In approximately 12 minutes, VERB 06 NOUN 98 shall flash. From the CRT, DSKY display, record R2 [-NBDX (position 3)] .

6.3.9.11.6 Enter the following on K-148:

VERB 33	ENTR

6.3.9.11.7 In approximately 6 minutes, VERB 06 NOUN 98 shall flash. From the CRT DSKY, record R1 and R2 [+Z PIPA 1g (position +00003)]. Row 1 is whole part, Row 2 is fractional part.

6.3.9.11.8 Enter the following on K-148:

VERB 36	ENTR

6.3.9.12 Position 4 Stable Member Matrix Load.

6.3.9.12.1 Start tape reader.

6.3.9.12.2 When tape reader stops enter the following on K-148:

VERB 92	ENTR
00001	ENTR

6.3.9.12.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation azimuth ±0.5 deg.)
+28.516 ENTR (Correct test site latitude)
Verify values in R1 and R2 are correct.

6.3.9.12.4 Enter the following on K-148:

VERB 33	ENTR

6.3.9.12.5 In approximately 12 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY, record R2 [+NBDY + ADSRAY (position +00004)] .

6.3.9.12.6 Enter the following on K-148:

VERB 33	ENTR

6.3.9.12.7 In approximately 6 minutes, VERB 06 NOUN 98 shall flash. From the CRT DSKY record R1 and R2 [-Z PIPA 1g (position +00004)]. Row 1 is whole part, Row 2 is fractional part.

6.3.9.12.8 Enter the following on K-148:

VERB 33 ENTR

6.3.9.12.9 In approximately 67 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY record R2 [+NBDZ + ADIAZ (position +00004)].

6.3.9.12.10 Enter the following on K-148:

VERB 36 ENTR

6.3.9.13 Position 5 Stable Member Matrix load.

6.3.9.13.1 Start tape reader.

6.3.9.13.2 When tape reader stops enter the following on K-148:

VERB 92 ENTR
00001 ENTR

6.3.9.13.3 Observe VERB 21 NOUN 01 flashing on K-148 enter the following:

+XXX.XX ENTR (Correct navigation azimuth ±0.5 deg.)
+28.516 ENTR (Correct test site latitude)
Verify values in R1 and R2 are correct.

6.3.9.13.4 Enter the following on K-148:

VERB 33 ENTR

6.3.9.13.5 The PROG alarm and GIMBAL LOCK lamps shall light. Press Error Reset.

6.3.9.13.6 In approximately 5 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY record R1 and R2 [+Y PIPA (position +00005)].

6.3.9.13.7 Enter the following on K-148:

VERB 36 ENTR

6.3.9.14 Position 6 Stable Member Matrix Load.

6.3.9.14.1 Start tape reader.

6.3.9.14.2 When tape reader stops enter the following on K-148:

VERB 92 ENTR
00001 ENTR

6.3.9.14.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation azimuth ±0.5 deg.)
+28.516 ENTR (Correct test site latitude)
Verify values in R1 and R2 are correct.

6.3.9.14.4 Enter the following on K-148:

VERB 33 ENTR

6.3.9.14.5 The PROG alarm and GIMBAL LOCK lamps shall light. Press Error Reset.

6.3.9.14.6 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. From the CRT DSKY record R1 and R2 [-Y PIPA (position +00005)].

6.3.9.14.7 Enter the following on K-148:

VERB 36 ENTR

6.3.9.15 Position 7 Stable Member Matrix Load.

6.3.9.15.1 Start tape reader.

6.3.9.15.2 When tape reader stops enter the following on K-148:

VERB 92 ENTR
00001 ENTR

6.3.9.15.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation azimuth ±0.5 deg.)
+28.516 ENTR (Correct test site latitude)
Verify values in R1 and R2 are correct.

6.3.9.15.4 Enter the following on K-148:

VERB 33 ENTR

6.3.9.15.5 In approximately 12 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY record R2 [+.707 ADSRAX - NBDX (position +00007)].

6.3.9.15.6 On K-148 enter the following:

VERB 36	ENTR

6.3.9.16 Position 8 Stable Member Matrix Load.

6.3.9.16.1 Start tape reader.

6.3.9.16.2 When tape reader stops enter the following on K-148:

VERB 92	ENTR
00001	ENTR

6.3.9.16.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation azimuth ±0.5 deg.)
+28.516 ENTR (Correct test site latitude.)
Verify values in R1 and R2 are correct.

6.3.9.16.4 Enter the following on K-148:

VERB 33	ENTR

6.3.9.16.5 In approximately 12 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY record R2 [-.707 (NBDZ + NBDY) +0.5 (ADSRAY + ADSRAZ) +0.5 (ADIAZ - ADIAY) (position 8)].

6.3.9.16.6 On K-148 enter the following:

VERB 36	ENTR

6.3.9.17 Position 9 Stable Member Matrix Load.

6.3.9.17.1 Start tape reader.

6.3.9.17.2 When tape reader stops enter the following on K-148:

VERB 92	ENTR
00001	ENTR

6.3.9.17.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation azimuth ±0.5 deg.)
+28.516 ENTR (Correct test site latitude.)
Verify values in R1 and R2 are correct.

6.3.9.17.4 Enter the following on K-148:

VERB 33 ENTR

6.3.9.17.5 In approximately 12 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY record R2 [-NBDZ + .707 ADSRAZ (position +00009)].

6.3.9.17.6 On K-148 enter the following:

VERB 36 ENTR

6.3.9.18 Position 10 Stable Member Matrix Load.

6.3.9.18.1 Start tape reader.

6.3.9.18.2 When tape reader stops enter the following on K-148:

VERB 92 ENTR
00001 ENTR

6.3.9.18.3 Observe VERB 21 NOUN 01 flashing. On K-148 enter the following:

+XXX.XX ENTR (Correct navigation azimuth ±0.5 deg.)
+28.516 ENTR (Correct test site latitude.)
Verify values in R1 and R2 are correct.

6.3.9.18.4 Enter the following on K-148:

VERB 33 ENTR

6.3.9.18.5 In approximately 12 minutes VERB 06 NOUN 98 shall flash. From the CRT DSKY record R2 [.707 (NBDY - NBDX) +.5 (ADIAY - ADIAX) +.5 ADSRAX (position +00010)].

6.3.9.18.6 On K-148 enter the following:

VERB 36 ENTR

Addition 7: The following procedure should be used when DANCE flight ropes are installed in the S/C.

6.3.12 Gimbal Friction Test.

6.3.12.1 Inner Gimbal Friction Test.

6.3.12.1.1 On K-148 enter the following sequences:

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+17000		ENTR
+17000		ENTR
+17000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+27000		ENTR
+27000		ENTR
+27000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

6.3.12.1.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00200).

6.3.12.1.3 Set up Analog Recorder to monitor the following signals:

MEASUREMENT NO.	SIGNAL NAME
a. GG 2110	IG Torque Motor Current
b. GG 2106	IG Servo Error Total
c. GG 2107	IG Servo Error in Phase
d. GG 2112	IG 1x Resolver Sine
e. GG 2113	IG 1x Resolver Cosine
f. GG 2220	IG CDU Fine Error
g. GG 1201	IMU 28V 1% 800 CPS
h. GG 2221	IG CDU Coarse Error

6.3.12.1.4 Set up Analog Recorder to monitor the following signals:

MEASUREMENT NO.	SIGNAL NAME
a. GG 2300	PIPA TEMP
b. GG 2301	IRIG TEMP
c. GG 1520	+28 VDC LGC OPR BUS

6.3.12.1.5 After 10 seconds has elapsed since step 6.3.12.1.1, enter the following into K-148:

VERB 21 NOUN 01 ENTR
02500 ENTR
00000 ENTR

6.3.12.1.6 Verify on CRT, DSKY display:

VERB 21 NOUN 01
R1 = 00000
R3 = 02500

6.3.12.1.7 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
37777 ENTR ENTR
37743 ENTR ENTR
00000 ENTR ENTR
00000 ENTR (once)

6.3.12.1.8 Start analog recorders using a chart speed of 10 mm/sec.
(IG-360° TORQUE)

6.3.12.1.9 On K-148 enter the following sequences:

VERB 01 NOUN 01 ENTR
01273 ENTR
Records contents of Row 1 XXXXY
VERB 21 NOUN 01 ENTR
01273 ENTR
XXXXY' ENTR
Where Y' is obtained from Table II of section 6.3.9.
VERB 42 ENTR
VERB 33 ENTR

6.3.12.1.10 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.1.11 On K-148 enter the following sequence:

```
VERB 40     NOUN 20     ENTR   Wait 3 seconds
VERB 41     NOUN 20     ENTR
+00000                  ENTR
+00000                  ENTR
+00000                  ENTR
```

6.3.12.1.12 On the CRT, verify CDU X, CDU Y, CDU Z all indicate +000.00 (±002.00).

6.3.12.1.13 After 10 seconds has elapsed since step 6.3.12.1.11 enter the following sequence into K-148:

```
VERB 21     NOUN 01     ENTR
02500                   ENTR
00000                   ENTR
```

6.3.12.1.14 Verify on CRT, DSKY display:

```
VERB 21     NOUN 01
R1          00000
R3          02500
```

6.3.12.1.15 On K-148 enter the following sequence:

```
NOUN 15     ENTR
00000       ENTR        ENTR
40000       ENTR        ENTR
40034       ENTR        ENTR
00000       ENTR        ENTR
00000       ENTR        (once)
```

6.3.12.1.16 Start analog recorders using a chart speed of 10 mm/sec (IG +360° TORQUE).

6.3.12.1.17 On K-148 enter the following sequence:

```
VERB 42     ENTR
VERB 33     ENTR
```

6.3.12.1.18 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.2 **Outer Gimbal Friction Test.**

6.3.12.2.1 On K-148 enter the following sequence:

VERB 40	NOUN 20	ENTR	Wait 3 seconds
VERB 41	NOUN 20	ENTR	
+00000		ENTR	
+00000		ENTR	
+00000		ENTR	

6.3.12.2.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +000.00 (±002.00).

6.3.12.2.3 Set up analog recorder to monitor the following:

MEASUREMENT NO.	SIGNAL NAME
a. GG 2167	OG Servo Error In Phase
b. GG 2170	OG Torque Motor Current
c. GG 2166	OG Servo Error Total
d. GG 2280	OG CDU Fine Error
e. GG 2172	OG 1X Resolver Sine
f. GG 2173	OG 1X Resolver Cosine
g. GG 2281	OG CDU Coarse Error

6.3.12.2.4 After 10 seconds has elapsed since step 6.3.12.2.1 enter the following:

VERB 21	NOUN 01	ENTR
02500		ENTR
37777		ENTR

6.3.12.2.5 Verify on CRT, DSKY display:

VERB 21	NOUN 01
R1	37777
R3	02500

6.3.12.2.6 On K-148 enter the following sequence:

NOUN 15	ENTR	
37743	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	(once)

6.3.12.2.7 Start analog recorders using a chart speed of 10 mm/sec. (OG -360° TORQUE)

6.3.12.2.8 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.2.9 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.2.10 On K-148 enter the following sequence:

VERB 40	NOUN 20	ENTR	Wait 3 seconds
VERB 41	NOUN 20	ENTR	
+00000	ENTR		
+00000	ENTR		
+00000	ENTR		

6.3.12.2.11 On the CRT, verify CDU X, CDU Y, CDU Z indicates +000.00 (±002.00).

6.3.12.2.12 After 10 seconds has elapsed since step 6.3.12.2.10, enter the following sequence into K-148:

VERB 21	NOUN 01	ENTR
02500	ENTR	
40000	ENTR	

6.3.12.2.13 Verify on CRT, DSKY display:

VERB 21	NOUN 01
R1	40000
R3	02500

6.3.12.2.14 On K-148 enter the following sequence:

NOUN 15	ENTR	
40034	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	(once)

6.3.12.2.15 Start analog recorders using a chart speed of 10 mm/sec (OG +360° TORQUE).

6.3.12.2.16 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.2.17 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.3 Middle Gimbal Friction Test.

6.3.12.3.1 On K-148 enter the following sequence:

VERB 40	NOUN 20	ENTR	Wait 3 seconds
VERB 41	NOUN 20	ENTR	
+00000	ENTR		
+00000	ENTR		
+06750	ENTR		

6.3.12.3.2 On the CRT, verify CDU X = +000.00±002.00, CDU Y = +000.00±002.00, and CDU Z = +067.50±002.00.

6.3.12.3.3 Set up analog recorder to monitor the following:

MEASUREMENT NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2137	MG Servo Error In Phase
c. GG 2150	MG Torque Motor Current
d. GG 2143	MG 1X Resolver Cosine
e. GG 2250	MG CDU Fine Error
f. GG 2142	MG 1X Resolver Sine
g. GG 2251	MG CDU Coarse Error

6.3.12.3.4 After 10 seconds have elapsed since step 6.3.12.3.1, enter the following sequence into K-148:

VERB 21	NOUN 01	ENTR
02500		ENTR
00000		ENTR

6.3.12.3.5 Verify on CRT, DSKY display:

VERB 21 NOUN 01
R1 = 00000
R3 = 02500

6.3.12.3.6 On K-148 enter the following sequence:

NOUN 15	ENTR	
00000	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	ENTR
14000	ENTR	ENTR
00000	ENTR	(once)

6.3.12.3.7 Start analog recorders using a chart speed of 10 mm/sec. (MG -135° TORQUE)

6.3.12.3.8 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.3.9 Monitor analog recorder. When MG Torque Motor Current (GG 2140) drops to a quiescent level (approximately 6 minutes), stop the recorders.

6.3.12.3.10 On K-148 enter the following sequence:

VERB 40	NOUN 20	ENTR	Wait 3 seconds
VERB 41	NOUN 20	ENTR	
+00000	ENTR		
+00000	ENTR		
-06750	ENTR		

6.3.12.3.11 On the CRT, verify CDU X = +000.00±002.00, CDU Y = +000.00±002.00, and CDU Z = -067.50±002.00.

6.3.12.3.12 After 10 seconds has elapsed since step 6.3.12.3.10, enter the following sequence into K-148:

VERB 21	NOUN 01	ENTR
02500	ENTR	
00000	ENTR	

6.3.12.3.13 On the CRT, DSKY display verify:

VERB 21	NOUN 01
R1 =	00000
R3 =	02500

6.3.12.3.14 On K-148 enter the following sequence:

NOUN 15	ENTR	
00000	ENTR	ENTR
00000	ENTR	ENTR
00000	ENTR	ENTR
63777	ENTR	ENTR
77777	ENTR	(once)

6.3.12.3.15 Start analog recorders using a chart speed of 10 mm/sec. (MG +135° TORQUE)

6.3.12.3.16 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.3.17 Monitor analog recorder. When the MG Torque Motor Current signal (GG 2140) drops to a quiescent level (approximately 6 minutes) stop the recorders.

6.3.12.3.18 On K-148 enter the following sequence:

VERB 41	NOUN 20	ENTR
+00000	ENTR	
+00000	ENTR	
+00000	ENTR	
Wait 15 seconds		
VERB 36	ENTR	

6.3.12.4 **Test Analysis**

6.3.12.4.1 Remove the strip charts from analog recorders.

6.3.12.4.2 Examine each trace carefully to detect any sharp discontinuities of the traces. Disregard all transients less than 0.5 second (5 mm) on any Torque Motor Current signal. [illegible]

6.3.12.4.3 No Torque Motor Current signal on (GG 2140, GG 2170, GG 2110) shall exceed (0.125) amp. Sensitivity on recorder is 20 ma/division for GG 2110, GG 2140 and 36 ma/division for GG 2170.

6.3.12.4.4 Each CDU Fine Error (GG 2220, GG 2280, GG 2250) shall not exceed .070 volts steady state. Disregard transients.

6.3.12.4.5 CDU Coarse Error (GG 2221, GG 2281, GG 2251) shall not exceed .680 volts.

Addition 8: Delete section 6.3.14 Fine Alignment Test.

Addition 9: Delete the following sections or paragraphs when DANCE flight ropes are installed in the S/C.

a. Paragraphs 6.3.1.5.1.1 and 6.3.1.5.1.2
b. Section 6.3.1.5.5
c. Delete "NOTE" after 6.3.3.

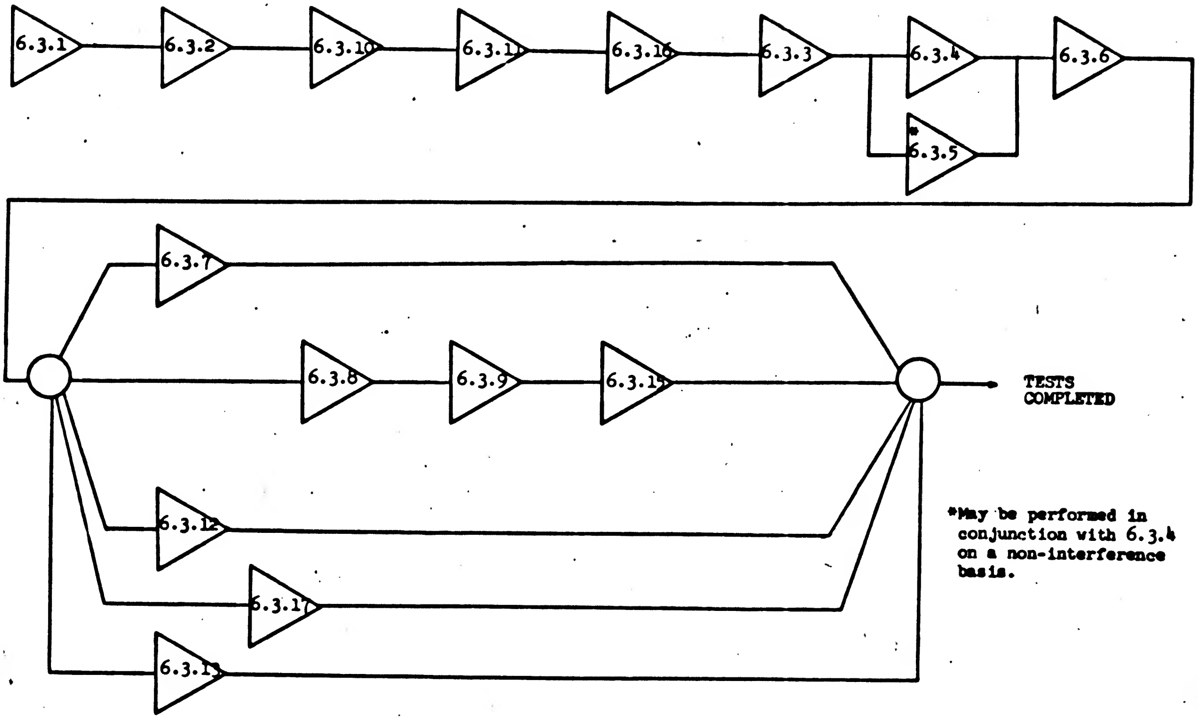
Addition 10: Replace Figures 1 and 2 with the following Figures 1 and 2 when DANCE flight ropes are installed in the S/C.

See Attachment.

TABLE I RETEST SEQUENCE

Paragraph Number	Test Title	LGC	IMU	PSA	CDU	PTA	DSKY	A HARNESS	B HARNESS	Computer Control & Reticle Dimmer	Nav Base	Alignment Optical Telescope	Signal Conditioner
6.3.1	Standby Power On Test	X	X	X			X	X	X		X		
6.3.2	Alarms and Interrupts Test	X					X	X					
6.3.3	IMU Operate Power on Test		X	X	X	X		X	X		X		X
6.3.4	Temperature Control Verification		X	X				X	X		X		X
6.3.5	PGNCS Power Supply Test			X	X	X		X	X		X		X
6.3.6	IMU Operational Test	X	X	X	X	X		X	X		X		
6.3.7	PGNCS Operational Test		X	X	X			X	X		X		X
6.3.8	IRIG Scale Factor Test		X	X		X		X	X		X		
6.3.9	IMU Performance Test		X	X		X		X	X		X		
6.3.10	LGC Voltage Margin Test	X						X					
6.3.11	LGC Clock Frequency Test	X						X		X			
6.3.12	Gimbal Friction Test		X	X				X	X		X		X
6.3.13	Stabilization Loop Response Test		X	X		X		X	X		X		
6.3.15	AOT Functional Performance Test											X	
6.3.16	Flight Rope Fixed Memory Bank Sum Check	X						X					
6.3.17	LGC Clock Alignment Test	X						X					
6.2.1	Emergency Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.2	Normal Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.3	Initial Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.4	General Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*

* To be used as necessary to turn system on or off.



*May be performed in conjunction with 6.3.4 on a non-interference basis.

TEST PROCEDURE FLOWGRAM
FIGURE 2

ADDENDUM IV

LM 4 and subsequent Spacecraft measurement deletions.

Addition 1: Page 19, paragraph 6.3.1.3.4, delete last sentence.

Addition 2: Page 26, delete paragraph 6.3.4.2.

Addition 3: Page 26, replace paragraph 6.3.4.3 with the following:

> 6.3.4.3 When 1 hour has elapsed from the time of IMU OPERATE power turn-on, monitor PIPA TEMP (GG 2300). Monitor and record temperature readings every 5 minutes for 30 minutes. Verify that each reading does not deviate from the average value by more than 0.1° F.

Addition 4: Page 26, delete paragraph 6.3.4.6.

Addition 5: Page 35, delete paragraph 6.3.7.24.

Addition 6: Page 59, delete paragraph 6.3.12.1.4.b.

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POST INSTALLATION CHECKOUT
SPECIFICATION FOR LM G&N SYSTEM (KSC)

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approval
2/21/67	A	33482	2, 3, 5-75; was 75 pages, now 83 pages.	MGM EA
3/30/67	B	34079	1, 2, 6-18, 20-86; Was 83 pages now 86 pages.	EA
8/24/67	C	34437	19	EA
10/12/67	D	34840	3, 5-86; was 86 pages, now 128 pages.	EA
1/22/68	E	35471	2, 3, 5, 6, 8-10, 12-15, 17-22, 24, 26-28, 30-35,	EA
			41, 42, 44, 45-128; was 128 pages, now 132	
			pages.	
5/13/68	F	36212	1, 2, 8-132; was 132 pages, now 155 pages.	EA WLS

This specification consists of page 1 to 155 inclusive.

APPROVALS	NOT REQUIRED CCA497-0274 NASA/MSC	12/ /66		ACTD

1. INTRODUCTION

1.1 The individual Spacecraft (SC) installed Guidance and Navigation (G&N) System to be checked out per the process specification shall consist of one of each of the following major assemblies. Refer to drawing 6015000 for specific system dash numbers and effectivities.

Assembly Name	Part Number
1 - Apollo Guidance Computer Group	6003001-XXX
1 - Inertial Meas. Unit & Pulse Torque Assembly	6007001-XXX
1 - Coupling Data Unit	2007222-XXX
1 - Power and Servo Assembly	6007200-XXX
1 - Computer Control & Reticle Dimmer Assembly	6014512-XXX
1 - G&N Interconnect Harness Assembly (LEM)	6014515-XXX
1 - Signal Conditioner Assembly	6070010-XXX
1 - Navigation Base Assembly (LEM)	6899950-XXX
1 - Alignment Optical Telescope (LEM)	6011000-XXX

1.2 The G&N System herein shall be identified by Part #6015000. The computer contains the BURST 120 program flight ropes in the core rope memory. Addendum III to this specification contains DANCE 292 program system checkout procedures.

2. SCOPE

2.1 This specification outlines the checkout requirements for G&N System installed in a LEM Vehicle. Addendum to this specification will cover any special checkout requirements associated with individual vehicles, G&N Systems and Computer Flight Programs.

3. APPLICABLE DOCUMENTS

3.1

Document Number	Subject
LIS-540-10001	LEM-PGNS Functional Interface
LID-340-10000	ICD-PGNS (LGC-CDU-PSA and Sig. Cond.) Instl.
LID-340-10010	ICD-LEM DSKY Installation
LID-280-10004	ICD-IMU-AOT-NVB-PTA Installation
LID-390-10001	ICD-LEM Wiring Electrical Interface for PGNS
LID-540-10001	ICD-LEM-PGNS Functional Interface Flow Diagram

5.6.1.2 Failure to be within the maximum values of D_1, D_2 and D_3 after the retest sequence of 5.6.1.1 shall constitute a failure of the assembly.

5.6.1.3 If authority has been obtained to degauss a PIPA, then data taken prior to the degaussing of that PIPA shall not be used in the future to calculate stability terms. After degaussing, the retest sequence of Paragraph 5.6.1.1 must be performed.

5.6.2 Failure of the G&N System to pass any examination or test specified herein shall tentatively classify the G&N system as non-conforming. Normal test sequence may be continued upon determination of the cause of the nonconformance or at the discretion of the G&N contracter test team if it is determined that such action is not detrimental to the G&N System or other interfacing subsystems. All nonconformances shall be investigated and cleared by waivers (F.N.N), correction of specification, or hardware replacement and retest. The suspected malfunctioned hardware shall be removed and returned to the laboratory where the malfunction shall be verified. Only after malfunction verification shall a flight certified replaceable element be installed in the G&N System.

5.7 Retest subsequent to replacement of a malfunctioned assembly with that of a flight certified assembly shall be at the discretion of NASA Engineering. Table I can be used as a guide to determine general retest requirements. In all retest procedure, the test sequence of Figure 2 shall be adhered to.

5.8 It is assumed that the Test Conductor has a working knowledge of the test equipment used; therefore, this procedure contains only the steps pertaining directly to the G&N components. If any questions arise concerning the test equipment, the Test Conductor should refer to the respective operational manuals.

5.9 Spacecraft systems other than the G&N System may be operating on a noninterfering basis while individual system checkout of the G&N is being conducted.

5.10 Data Retrival

5.10.1 All data concerning the checkout and operation of the G&N System as monitored via ACE, shall be recorded on the data sheets associated with their corresponding test. Out of tolerance readings shall be recorded and flagged by appropriate signals.

5.10.2 During G&N System testing, all interleaved data, Uplink Command File and Downlink Data File shall be maintained (recorders ON). All A/B PCM data, that is not made available to the ACE displays shall be verified by requesting a time history data strip out of said data for the time period when the test was performed.

5.11 General Operating Characteristics

5.11.1 The DSKY "NO ATT" lamp illuminates any time the system is in the Coarse Align Mode or IMU Cage including Turn On.

[illegible]

G.&N. [illegible]	[illegible]	[illegible]
[illegible]	X	[illegible]
[illegible]	X	[illegible]
[illegible]	X	[illegible]
[illegible]	X	[illegible]
[illegible]	X	[illegible]
[illegible]	X	[illegible]
[illegible]	X	[illegible]
[illegible]	X	[illegible]
[illegible]	X	[illegible]
X PIPA BIAS & G.P. ERROR	X	[illegible]
Y PIPA BIAS & G.P. ERROR	X	[illegible]
Z PIPA BIAS & G.P. ERROR	X	[illegible]

TABLE 6

A - Wait until SIGNAL LOCK lamp goes out before performing this step.

B - On D-140 enter the following

V21 ENTR
+000XX ENTR
+00070 ENTR
+000XX ENTR Where X is test position number represented in [illegible] Rev 3 display

C - When VERB of [illegible] 05 flashes do not record test results.

TABLE 6

O.Q.S PARAMETER	PERFORM POSITIONS	PARAMETERS TO BE REQUALIFIED
NBDY	1	NBDY
NBDZ	2	NBDZ
NBDX	3	NBDX
ADSRAY	1 and 4	ADSRAY, NBDY
ADSRAZ	2 and 9	ADSRAZ, NBDZ
ADSRAX	3 and 7	ADSRAX, NBDX
ADIAY	1 thru 3, 7 and 10	NBDY, NBDX, ADIAX, ADSRAX, ADIAY,
ADIAZ	2 thru 4	NBDZ, NBDX, ADIAZ
ADIAX	1 thru 3	NBDX, ADIAX, NBDY, [illegible]
X PIPA Bias or S.F.	1 thru 2	X PIPA BIAS, X PIPA [illegible] S.F.
Y PIPA Bias or S.F.	5 and 6	Y PIPA BIAS Y PIPA S.F.
Z PIPA Bias or S.F.	3 and 4	Z PIPA Bias, [illegible] Z PIPA S.F.

Paragraph No.	Test Title
6.3.1	Standby Power In Test
6.3.2	Alarms and Interrupts Test
6.3.3	IMU Operate Power On Test
6.3.4	Temperature Control Verification
6.3.5	PGNCS Power Supply Test
6.3.6	IMU Operational Test
6.3.7	PGNCS Operational Test
6.3.8	IRIG Scale Factor Test
6.3.9	IMU Performance Test
6.3.10	LGC Voltage Margin Test
6.3.11	LGC Clock Frequency Test
6.3.12	Gimbal Friction Test
6.3.13	Stabilization Loop Response Test
6.3.14	G and N Fine Alignment Test
6.3.15	AOT Functional Performance Test
6.3.16	Flight Rope Fixed Memory Bank Sum Check
6.3.17	LGC Clock Alignment Test

G&N TESTS

FIGURE 1

6. DETAILED REQUIREMENTS

6.1 Initial Test Conditions

6.1.1 The IMU shall be supplied with heater power on a continuous basis. The portable temperature controller (Model No. 410-31058) shall be connected at all times although heater power may be supplied from the +28 VDC IMU STANDBY bus and monitored through ACE.

6.1.2 The IMU shall never be without heater power longer than 15 minutes.

6.2 Operational Requirements

TABLE I RETEST SEQUENCE

Paragraph Number	Test Title	LGC	IMU	PSA	CDU	PTA	DSKY	A HARNESS	B HARNESS	Computer Control & Reticle Dimmer	Nav Base	Alignment Optical Telescope	Signal Conditioner
6.3.1	Standby Power On Test	X	X	X			X	X	X		X		
6.3.2	Alarms and Interrupts Test	X					X	X					
6.3.3	IMU Operate Power On Test		X	X	X	X		X	X		X		X
6.3.4	Temperature Control Verification		X	X				X	X		X		X
6.3.5.	PGNCS Power Supply Test			X	X	X		X	X		X		X
6.3.6	IMU Operational Test	X	X	X	X	X		X	X		X		
6.3.7	PGNCS Operational Test		X	X	X			X	X		X		X
6.3.8	IRIG Scale Factor Test		X	X		X		X	X		X		
6.3.9	IMU Performance Test		X	X		X		X	X		X		
6.3.10	LGC Voltage Margin Test	X						X					
6.3.11	LGC Clock Frequency Test	X						X		X			
6.3.12	Gimbal Friction Test		X	X				X	X		X		X
6.3.13	Stabilization Loop Response Test		X	X		X		X	X		X		
6.3.14**	G&N Fine Alignment Test		X									X	
6.3.15	AOT Functional Performance Test											X	
6.3.16	Flight Rope Fixed Memory Bank Sum Check	X						X					
6.3.17	LGC Clock Alignment Test	X						X					
6.2.1	Emergency Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.2	Normal Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.3	Initial Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.4	General Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*

* To be used as necessary to turn system on or off.

** If IMU or AOT is replaced, Aurora 88 ropes will be installed in the S/C to perform this test. 6.3.14 can be found in ND 1002323.

6.2.6 A warmup period of at least one hour in Operate Mode is required prior to performing any test in which gyro or accelerometer parameters are measured, and at least 15 minutes prior to any test in which precision amplitude and frequency power supply checks are made.

6.3 Test Procedures

6.3.1 Standby Power On Tests

6.3.1.1 The Portable Temperature Controller, Model No. 400-31058 shall be supplying inertial component heater power to the G&N System through connector 56J1 (P230). If alarm or fail indications are present on the PTC, they shall be cleared by depressing the SYSTEM RESET push-button on the PTC.

6.3.1.2 The following switches and/or circuit breakers shall be closed to energize the indicated buses. On Panel 5 rotate ANUN/NUM dimmer to minimum discernable brightness. On Panel 5 set the LIGHTING OVERRIDE switch to OFF.

LOCATION	NOMENCLATURE	IDENTIFICATION
Panel 14	BAT 5 NORMAL FEED	4S10
Panel 14	BAT 6 NORMAL FEED	4S11
Panel 16	X LUNAR BUS TIE	4CB5
Panel 16	BAT 1-4-6 FEED TIE	4CB17
Panel 16	BAT 2-3-5 FEED TIE	4CB25
Panel 16	ASC ECA	4CB14
Panel 16	ASC ECA CONT.	5CB7
Panel 16	DC BUS VOLT	4CB21
Panel 16	DISP.	4CB16
Panel 11	X LUNAR BUS TIE	4CB4
Panel 11	BAT 1-4-6 FEED TIE	4CB18
Panel 11	BAT 2-3-5 FEED TIE	4CB26
Panel 11	ASC ECA	4CB15
Panel 11	ASC ECA CONT.	4CB6
Panel 11	DC BUS VOLT	4CB22
Panel 16	INV. NO. 2	4CB13
Panel 14	AC PWR to INV 2 Position	4S14
Panel 11	AC BUS FEED TIE	4CB24
Panel 11	AC BUS VOLT	4CB27
Panel 11	LTG ANUN/DOCK COMP	4CB146
Panel 16	LTG ANUN/DOCK COMP	4CB148

6.3.1.3 IMU Standby Power Turn On

6.3.1.3.1 Deleted.

6.3.1.3.2 Press in +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11. Record time.

6.3.1.3.3 Verify on the Event Recorder that +28 VDC IMU STANDBY power discrete (GG 1513) is on. On CRT +28V IMU STANDBY Bus (GG 1510) shall indicate between 24.5 and 33.5

6.3.1.3.4 The PIPA TEMP, displayed on CRT, shall be monitored periodically one hour to ensure that the PIPA Temperature Control circuitry is operating to maintain a temperature of 130±5.0 Deg. F. (GG 2300). One hour after performing step 6.3.1.3.2 record PIPA TEMP. The PIPA Temperature shall be 130.5° ±1.5° F. The IRIG temperature shall be within 3.0° F of the PIPA Temperature.

6.3.1.4 Computer Power Turn On

6.3.1.4.1 Press in +28VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11. RESTART light may be ON, verify LGC WARNING is OFF.

6.3.1.4.2 On CRT, +28V LGC Operate Bus (GG 1520) shall indicate between 23.5 and 32.5. Verify on event recorder that +28V LGC OP (GG 1523X) discrete is on. Using DSKY, enter VERB 36 ENTR then press RSET. All computer alarms shall clear.

6.3.1.4.3 On CRT, the +14VDC LGC SUPPLY (GG 1020) shall indicate between 13.6 and 14.4 VDC. Record this value.

6.3.1.4.4 On CRT the 28V 3200 CPS SUPPLY (GG 1331) shall indicate between a 28.04 and 29.16 VRMS. Record this value.

6.3.1.5 LGC Operational Tests

6.3.1.5.1 DSKY Check

6.3.1.5.1.1 Enter the following in K-148:

Press Error Reset
VERB 21 NOUN 01 ENTR
00377 ENTR (SMRTFLG)
37777 ENTR
Verify COMP ACTY lamp is lit
VERB 21 NOUN 27 ENTR
00011 ENTR

6.3.1.5.1.2 All the electroluminescent elements (PROG, VERB, NOUN and Row 1, Row 2, Row 3) shall display the decimal number nine (9). Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0/s
k. Minus signs in ROW 1, ROW 2, ROW 3
l. VERB-NOUN Flashing
m. COMP ACTY

} On concurrently for 5 seconds

6.3.2.1.2 On CRT, DSKY display, verify R1 = 33777 and R3 = 03377

6.3.2.1.3 On K-148 enter the following sequence

VERB 25 NOUN 26 ENTR
04000 ENTR
01777 ENTR
00006 ENTR
VERB 30 ENTR

6.3.2.1.4 Verify RESTART lamp is ON.

6.3.2.1.5 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.2.2 Rupt Lock-Interrupt Too Long

6.3.2.2.1 On K-148 enter the following sequence:

VERB 24 NOUN 01 ENTR
03376 ENTR
30001 ENTR
01776 ENTR
VERB 25 NOUN 26 ENTR
00001 ENTR
01776 ENTR
00006 ENTR
VERB 31 ENTR

6.3.2.2.2 Verify RESTART, and PGNCS CAUTION lamps are ON.

6.3.2.2.3 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.2.3 TC Trap Test

6.3.2.3.1 On K-148 enter the following sequence:

VERB 21 NOUN 01 ENTR
03377 ENTR
01777 ENTR
VERB 25 NOUN 26 ENTR
04000 ENTR
01777 ENTR
00006 ENTR
VERB 30 ENTR

6.3.2.3.2 Verify RESTART, and PGNCS CAUTION lamps are ON.

6.3.2.3.3 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.2.4 Nightwatchman Test

6.3.2.4.1 On K-148 enter the following sequence

VERB 24 NOUN 01 ENTR
03376 ENTR
30001 ENTR
01776 ENTR
VERB 25 NOUN 26 ENTR
04000 ENTR
01776 ENTR
00006 ENTR
VERB 30 ENTR

6.3.2.4.2 Verify RESTART lamp is ON. [illegible].

6.3.2.4.3 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.3 IMU OPERATE POWER ON TESTS

CAUTION

Prior to application of IMU OPERATE power in step 6.3.3.1.4, LGC OPERATE and IMU STANDBY power must have been applied to the G&N System continuously for a minimum of two hours. The only exception is when the requirements of step 6.2.4.10 are met and this does not apply for the initial application of IMU OPERATE power.

6.3.4 Temperature Control Verification

6.3.4.1 After IMU OPERATE turn-on, periodically check the PIPA TEMP for the next 15 minutes. The PIPA TEMP shall be within 0.5° of the PIPA TEMP measured in 6.3.1.3.4. 15 minutes after IMU OPERATE turn on the PIPA temperature shall be within 0.5° F of its stabilized value.

6.3.4.2 When 30 minutes have elapsed from the time of IMU OPERATE power turn-on record IRIG TEMP (GG 2301). The IRIG TEMP shall be within 0.5° of its stabilized value.

6.3.4.3 When 1 hour has elapsed from the time of IMU OPERATE power turn-on, monitor PIPA TEMP (GG 2300) and IRIG TEMP (GG 2301) on the CRT. Monitor and record temperature readings every 5 minutes for 30 minutes. Verify that each reading does not deviate from the average value of each signal by more than 0.1° F.

6.3.4.4 The PIPA Temp shall be 130.5 (±1.5)°F. The IRIG TEMP shall be 135 (±2.5°)F.

6.3.4.5 The PIPA TEMP recorded in step 6.3.4.4 shall be within 1.0°F of the temperature recorded in steps 6.3.1.3.4 and within 0.5°F of the PIPA TEMP recorded in 6.3.4.1.

6.3.4.6 The IRIG TEMP recorded in step 6.3.4.4 shall be within 0.5°F of the temperature recorded in step 6.3.4.2.

6.3.4.7 Verify on the event recorder that IMU Blower Current (GG 2303) and IMU Heater Current (GG 2302) On discretes have been present for the last hour (discretes may cycle off).

6.3.5 PGNCS Power Supply Tests

6.3.5.1 From the CRT, confirm power supply voltages (or temperatures) are as specified and record values observed.

6.3.5.2 The PIPA Calibration Module Temperature (GG 6020) shall be between +45 and +90 DEG F.

6.3.5.3 The PSA Temperature (GG 6021) shall be between +60 and +110 DEG F.

6.3.5.4 The LGC Temperature (GG 4300) shall be between +45 and +130 DEG. F.

6.3.5.5 The +28 VDC IMU OPERATE BUS (GG 1500) shall be between 24.5 and 33.5 VDC.

6.3.5.6 The +28 VDC IMU STANDBY BUS (GG 1510) shall be between 24.5 and 33.5 VDC.

6.3.5.7 The +28 VDC LGC OPERATE BUS (GG 1520) shall be between 23.5 and 32.5 VDC.

6.3.5.8 The +120 VDC PIPA Supply (GG 1040) shall be between 114 and 126 VDC.

6.3.5.9 The -28 VDC Supply (GG 1100) shall be between -21.5 and -33.5 VDC.

6.3.5.10 The +4 VDC CDU Supply (GG 1070) shall be between 3.8 and 4.2 VDC.

6.3.5.11 The IMU 28V/800 CPS 1 pct Supply (GG 1201) shall be between 27.44 and 28.56 VRMS.

6.3.5.12 The IMU 28V 800 CPS 5 pct 90 PH Supply (GG 1202) shall be between 26.6 and 29.4 VRMS.

6.3.5.13 The IMU 28V 800 CPS 5 pct 0 PH Supply (GG 1203) shall be between 25.9 and 30.1 VRMS.

6.3.5.14 The 3.2 KC 28V Supply (GG 1331) shall be between 28.04 and 29.16 VRMS.

6.3.5.15 The 2.5 VDC T/M Bias (GG 1110) shall be between 2.4 and 2.6 VDC.

6.3.5.16 The +14 VDC LGC Supply (GG 1020) shall be between 13.6 and 14.4 VDC.

6.3.5.17 The +4 VDC LGC Supply (GG 1030) shall be between 3.8 and 4.2 VDC.

6.3.5.18 The phase difference between the 3.2 KC supply and LGC sync shall be 0±10° (NG 1336).

6.3.5.19 Record the noise levels of the following signals displayed on the CRT.

Item No.	Measurement No.	Signal	Requirement
a.	NG 1021	14 VDC LGC Noise RMS	<0.2 VRMS
b.	NG 1031	4 VDC LGC Noise RMS	<0.2 VRMS
c.	NG 1071	4 VDC CDU Noise RMS	<0.1 VRMS
d.	NG 1501	28 VDC IMU Operate Noise RMS	<1.0 VRMS
e.	NG 1511	28 VDC IMU Standby Noise RMS	<1.0 VRMS
f.	NG 1521	28 VDC LGC Operate Noise RMS	<2.0 VRMS

6.3.5.20 The noise peaks of the following signals are demonstrated on the event light when the peaks have a rise time between 2 and 50 μsec and the peak voltage exceeds 5 volts.

Item No.	Measurement No.	Signal
a.	NG 1022	14 VDC LGC Noise Peak
b.	NG 1032	4 VDC LGC Noise Peak
c.	NG 1072	4 VDC CDU Noise Peak
d.	NG 1502	28 VDC IMU Operate Noise Peak
e.	NG 1522	28 VDC LGC Operate Peak

6.3.5.21 The noise peaks of the following signals are demonstrated on the event light when the peaks have a rise time of between 2 and 50 μsec and the peak voltage exceeds 10 volts.

a.	NG 1512	28 VDC IMU Standby Peak.

6.3.6 IMU OPERATIONAL TEST

6.3.6.1 On K-148 enter the following:

VERB 01 NOUN 10 ENTR
00003 ENTR
Record CRT DSKY Row 1 indication AAAAA and the time of day.

6.3.6.2 On K-148 enter the following:

VERB 21 NOUN 01 ENTR
03377 ENTR
AAAAA ENTR
VERB 06 NOUN 02 ENTR
03377 ENTR
Record CRT DSKY Row 1 indication as ±BBBBB

6.3.6.3 Perform the following calculations:

a. $\frac{\text{BBBBB x 5.12}}{3600}$ = CCCC.C (Contents (hrs) of high order scalar register)

b. 23.3 - CCCC.C = DDDD.D hours

c. DDDD.D + time of day recorded in 6.3.6.1 = time of day at which high order scalar register will overflow.

6.3.6.4 If time of day is within 12 minutes of that calculated in 6.3.6.3.c when about to perform any of the following paragraphs, wait until that time calculated in 6.3.6.3.c has passed and proceed.

6.3.6.5 In K-148 enter the following sequence:

VERB 57 ENTR
00004 ENTR

6.3.6.6 Wait 200 seconds, then verify on the CRT, that the X, Y and Z PIPA SG Output signals all indicate 0.0±2.5 Volts but not 0.

6.3.6.7 Approximately 12 minutes after performing step 6.3.6.1, VERB 06 NOUN 06 shall flash.

6.3.9.67 Terminate this test by entering in K-148 the following:

VERB 36 ENTR

6.3.9.68 On CRT, record IRIG TEMP (CG2301) and PIPA TEMP (CG 2300).

6.3.9.69 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.9.70 Calculations,
NOTE: Use Post Vibration or System Test data points only.

6.3.9.70.1 Y PIPA Data Correction Calculation

6.3.9.70.1.1 From the uplink file tape, the compressed data tape or the PCM tape, request a data reduction of the X and Z accelerometer ΔV counts (addressed 37 and 41 respectively) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the period during which the Y PIPA test was being performed in positions 5 and 6 of the IMU Performance test.

6.3.9.70.1.2 Perform the following calculations for position 5.

$$G'_5 = \frac{G_5}{\text{Cos } \theta}$$

where:
G_5 = Measured acceleration turn (line k)

G'_5 = Corrected acceleration term

$\text{Cos } \theta y_5 = \frac{1 - 1}{\theta^2 y_5}$ for small angles

$$\theta y_5 = \sqrt{\theta^2_{x5} + \theta^2_{z5}}$$

and:

$\theta_{z5} = (\Delta v_{x5} - \Delta V_z \text{ Bias}) (\text{S.F.}_z)/ (\Delta T) (\text{local } g)$

$\theta_{x5} = (\Delta V_{z5} - \Delta V_z \text{ Bias}) (\text{S.F.}_z)/(\Delta T) (\text{local } g)$

and:

V_x Bias = (X PIPA Bias) (ΔT) / S.F.$_x$

V_z Bias = (Z PIPA Bias) (ΔT) / S.V.$_z$

S.F. and Bias terms are obtained from positions 1 through 4 of the IMU Performance Test.

6.3.9.70.1.5 Perform the following calculations for position 6.

$$G'_6 = \frac{G_6}{\cos \theta y_6}$$

Where:

G_6 = Measured acceleration term (line e)

G'_6 = Corrected acceleration term

$\cos \theta y_6 = \frac{1 - 1}{\theta^2 y_6}$ for small angles

$\theta y_6 = \theta^2{}_{x6} + \theta^2{}_{z6}$

and:

θ_{x6} = (ΔV_{x6} - ΔV_x Bias) (S.F.$_x$) / (ΔT) (local g)

θ_{z6} = (ΔV_{z6} - ΔV_z Bias) (S.F.$_z$) / (ΔT) (local g)

and:

V_x Bias = (X PIPA Bias) (ΔT) / S.F.$_x$

V_z Bias = (Z PIPA Bias) (ΔT) / S.F.$_z$

S.F. and Bias terms are obtained from positions 1 through 4 of the IMU Performance Test.

DATA SHEET

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.3.9. 14	+N BDY Transfer result to line af.	meru	( ) ---.--	a
6.3.9. 17	+ X PIPA Test Position +00001	cm/sec^2	( ) 00---. ( ) -----	b
6.3.9. 21	+N BDZ Position +00002 Transfer result to line ag	meru	( ) ---.--	c
6.3.9 23	-X PIPA Test Position +00002	cm/sec^2	( ) 00---. ( ) -----	d
6.3.9. 25	-N BDX + ADIAX Position +00002	meru	( ) ---.--	e
6.3.9 29	-N BDX Position +00003 Multiply by-1 and transfer result to line ah.	meru	( ) ---.--	f
6.3.9. 31	+Z PIPA Test Position +00003	cm/sec^2	( ) 00---. ( ) -----	g
6.3.9 35	+N BDY + ADSRAY Position +00004	meru	( ) ---.--	h
6.3.9. 38	-Z PIPA Test Position +00004	cm/sec^2	( ) 00---. ( ) -----	i
6.3.9. 40	+N BDZ + ADIAZ Position +00004	meru	( ) ---.--	j
6.3.9. 45	+Y PIPA Test Position +00005	cm/sec^2	( ) 00---. ( ) -----	k
6.3.9. 50	-Y PIPA Test Position +00006	cm/sec^2	( ) 00---. ( ) -----	l
6.3.9. 54	-NBDX + .707 ADSRAX Position +00007	meru		m
6.3.9. 58	-.707 (NBDZ+NBDY) +0.5 (ADIAZ-ADIAY) +0.5 (ADSRAY+ADSRAZ) Position +00008	meru		n
6.3.9 62	-NBDZ + .707 ADSRAZ Position +00009	meru		o
6.3.9. 66	.707 (NBDY-NBDX +.5 (ADIAY-ADIAX) +.5 ADSRAX Position +00010	meru		p

DATA SHEET

CALCULATION	PARAMETER	UNITS	
line e - line f = ( ) ---.-- (-NBDX+ADIAX) - (-NBDX) Transfer result to line al.	ADIAX	meru/g	q
line h - line a = ( ) ---.-- (+NBDY+ADSRAY) - (-NBDY) Transfer result to line ai.	ADSRAY	meru/g	r
line j - line c = ( ) ---.-- (+NBDZ+ADIAZ) - (NBDZ) Transfer result to line am.	ADIAX	meru/g	s
(line m - line f) X1.414 = ( ) ---.-- (-NBDX + .707 ADSRAX) -(-NBDX) X 1.414 Transfer result to line ak.	ADSRAX	meru/g	t
(line o + line c) X1.414 = ( ) ---.-- (-NBDZ + .707 ADSRAZ + NBDZ) X 1.414 Transfer result to line ai.	ADSRAZ	meru/g	u
(line p - .707 line a - .707 line f +.5 line q -.5 line t) X2 = ---.-- [.707 (NBDY-NBDX) +.5 (ADIAY-ADIAX) +.5 ADSRAX -.707 (-NBDX) -.707 NBDY +.5 ADIAX - .5 ADSRAX] X2 Transfer result to line an.	ADIAY	meru/g	v
line b - line d = ( )	PIPA X2G	cm sec^2	w
line k - line l = ( )	PIPA Y2G	cm/sec^2	x
line g - line i = ( )	PIPA Z2G	cm/sec^2	y
1958.48 ÷ line w x 1 cm/sec pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ao.	X PIPA S. F.	cm/sec/ pulse	z
1958.48 ÷ line x X1cm/sec/pulse = Subtract 1.000000 from this value, multiply X10^6 and transfer results to line ap.	Y PIPA S. F.	cm/sec/ pulse	aa
1958.48 ÷ line y X 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply X10^6 and transfer results to line aq.	Z PIPA S. F.	cm/sec/ pulse	ab
1/2 (line b + line d) = ( ) --.--- Transfer results to line ar.	X PIPA Bias	cm/sec^2	ac
1/2 (line k + line l) = ( ) --.--- Transfer results to line as.	Y PIPA Bias	cm/sec^2	ad
1/2 (line g + line i) = ( ) --.--- Transfer results to line at.	Z PIPA Bias	cm/sec^2	ae

DATA SHEET
(x_{1-2})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

6.3.10.2.7 On K-148 initiate LGC Self-Check by entering the following:

VERB 21 NOUN 27 ENTR
77767 ENTR

Wait 200 seconds. Verify RESTART lamp on the DSKY is not lit.

6.3.10.2.7.1 Into R154 insert 0101. Verify and execute.

6.3.10.2.8 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lighted.

6.3.10.2.9 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL switch to ON. Press ERROR RESET. Perform the following DSKY operations:

VERB 21 NOUN 27 ENTR
77767 ENTR

6.3.10.2.10 Enter in C-156 (±) XX.X001114 (Enter a value for XX.X which will adjust the +14V power supply (GG 1020) as monitored on the CRT, to 16.4 (+0.0, -0.1) vdc. See Table III. Execute.

6.3.10.2.11 On K-148 press ERROR RESET. Wait 200 seconds. Verify RESTART lamp on DSKY is not lighted.

6.3.10.2.11.1 Into R154 insert 0101. Verify and execute.

6.3.10.2.12 On the PSA Adapter Module place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lighted. Set the INHIBIT VOLTAGE FAIL switch to ON. Press ERROR RESET. Perform the following DSKY operations.

VERB 21 NOUN 27 ENTR
77767 ENTR

6.3.10.2.13 Enter in C-156 +XX.X001124 (Enter a value for XX.X which will adjust the 4V power supply (GG 1030) as monitored on the CRT, to 4.6 (+0.0, -0.03) vdc. See Table III. Execute.

6.3.10.2.14 On K-148 press ERROR RESET. Wait 200 seconds. Verify RESTART lamp on DSKY is not lit.

6.3.10.2.14.1 Into R154 insert 0101. Verify and execute.

[illegible] On the PSA Adapter Module [illegible] INHIBIT [illegible] INHIBIT VOLTAGE FAIL [illegible] DSKY operations:

[illegible] NOUN 27 ENTR
[illegible] ENTR

APPENDIX I

MEASUREMENT TOLERANCES

SIGNAL	SIGNAL NAME	G&N LAB TEST REQUIREMENT	PSAAN AND/OR SCA UNCERTAINTY % OF FULL SCALE
OG 1020 link 4*	+14 vdc LOC Supply	14.0±0.4 vdc	0%
OG 1030 link 4	+4 vdc LOC Supply	4.0±0.2 vdc	0%
OG 1040 link 5**	+120 vdc PIPA Supply	120±6.0 vdc	1%
OG 1070 link 4	+4 vdc CDU Supply	4.0±0.2 vdc	0%
OG 1100 link 4	-28 vdc Supply	-27.5±6.0 vdc	0%
OG 1110 link 5	2.5 vdc Telemetry Bias No. 1	2.5±0.1 vdc	0%
OG 1201 link 5	IMU 28V 800 cps 1%	28±0.56V rms	1%
OG 1202 link 4	IMU 28V 800 cps 5%	28±1.4V rms	1.5%
OG 1203 link 4	IMU 28V 800 cps 5%	28±2.1V rms	1.5%
OG 1331 link 5	3.2 kc 28V Supply 1%	28.6±0.56V rms	1%
OG 1500 link 4	+28 vdc IMU Oper BUS	28.0-3.5, +5.5 vdc	0%
OG 1510 link 4	+28 vdc IMU STBY BUS	28.0 -3.5, +5.5 vdc	0%
OG 1513X link 5	+28 vdc IMU STBY/OFF	28.0±1 vdc	0%
OG 1520 link 4	+28 vdc LOC Oper BUS	28.0±4.5 vdc -3.5 vdc	0%
OG 1523X link 5	+28 vdc LOC Operate	28.0±1 vdc	0%
OG 2001 link 5	X PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
OG 2021 link 5	Y PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
OG 2041 link 5	Z PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
OG 2106 link 4	IG Servo Error Total	0.0±60 MV rms at null	1%
OG 2107 link 5	IG Servo Error IN PH	0.0±60 MV rms at null	2%
OG 2110 link 4	IG Torque Motor Current	0.5 AMP Max during any fine Align Torque	0%
OG 2110 link 5	IG Torque Motor Current	0.5 AMP Max during any fine Align Torque	1%
OG 2112 link 5	IG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
OG 2113 link 5	IG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
OG 2121 link 5	IG 1X Resolver Out-Sine 11°	5.35±0.27V rms at 11°	2%
OG 2136 link 4	MG Servo Error Total	0.0±60 MV rms at null	1%
OG 2137 link 5	MG Servo Error IN PH	0.0±60 MV rms at null	2%
OG 2140 link 4	MG Torque Motor Current	0.5 AMP Max during any fine Align Torque	0%
OG 2140 link 5	MG Torque Motor Current	0.5 AMP Max during any fine Align Torque	1%
OG 2142 link 5	MG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
OG 2143 link 5	MG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
OG 2151 link 5	MG 1X Resolver Out-Sine 11°	5.35±0.27V rms at 11°	2%
OG 2166 link 4	OG Servo Error Total	0.0±60 MV rms at null	1%
OG 2167 link 5	OG Servo Error IN PH	0.0±60 MV rms at null	2%
OG 2170 link 4	OG Torque Motor Current	0.9 AMP Max during any fine Align Torque	0%
OG 2170 link 5	OG Torque Motor Current	0.9 AMP Max during any fine Align Torque	1%
OG 2172 link 5	OG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
OG 2173 link 5	OG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
OG 2181 link 5	OG 1X Resolver Out-Sine 11°	5.35±0.27V rms at 11°	2%
OG 2219 link 5	Pitch Attitude Error	5.05±0.5V rms at 17°	1%
OG 2220 link 4	IG CDU Fine Error	0.0±0.07V rms at null	1%
OG 2221 link 4	IG CDU Coarse Error	0.0±0.68V rms at null	1%

ADDENDUM II RR CDU TESTING

LM-3 & Subsequent

Addition 1: RR CDU testing requires that the Rendezvous Radar is operating. The Rendezvous Radar is not activated until Integrated testing. To insure that the RR CDU's are operating properly the minimum requirements for RR CDU testing are presented here so that they may be included as part of the requirements to be demonstrated at the first opportunity after Rendezvous Radar activation.

6.3.19 RR/CDU Control

6.3.19.1 Initialization

6.3.19.1.1 On K-148 enter the following:

VERB 36 ENTR
VERB 41 NOUN 72 ENTR
+00000 ENTR
+00000 ENTR
VERB 04 NOUN 06 shall flash.
Verify Row 2 = 00002

If Row 2 display is correct proceed to next step. If it is not correct, enter the following on K-148:

VERB 22 ENTR
00002 ENTR

6.3.19.1.2 On K-148 enter the following:

VERB 33 ENTR

Wait 25 seconds before continuing.

6.3.19.2 CDU Fine and CDU Coarse Error

6.3.19.2.1 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 3311	Shaft CDU Fine Error
b. GG 3312	Shaft CDU Coarse Error
c. GG 3321	Trunnion CDU Fine Error
d. GG 3322	Trunnion CDU Coarse Error

6.3.19.2.2 On K-148 enter the following:

VERB 44 ENTR
VERB 41 NOUN 72 ENTR
+04500 ENTR
+04500 ENTR
VERB 04 NOUN 06 shall flash.
Verify Row 2 = 00002
VERB 33 ENTR

Wait 10 seconds. Verify on CRT that RR CDU Trunnion and Shaft angles indicate 045.00±000.30 deg.

6.3.19.2.3 Verify the following signals on the CRT:

RR Shaft 1X Sine (GG 3304)	18.4±1.84 VRMS
RR Shaft 1X Cos (GG 3305)	18.4±1.84 VRMS
RR Trunnion 1X Sine (GG 3324)	18.4±1.84 VRMS
RR Trunnion 1X Cos (GG 3325)	18.4±1.84 VRMS

6.3.19.2.4 Verify CDU Fine Errors (GG 3311, GG 3321) do not exceed 0.07 volts.

6.3.19.2.5 Verify CDU Coarse Errors (GG 3312, GG 3322) do not exceed 0.680 volts.

6.3.19.3 RR CDU Fail.

6.3.19.3.1 On K-148 enter the following:

VERB 44 ENTR
VERB 41 NOUN 72 ENTR
+00100 ENTR
+00000 ENTR
VERB 04 NOUN 06 shall flash
Verify Row 2 = 00002
VERB 33 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00001 ENTR

Verify RR CDU Fail and Tracker Alarm come ON in approximately 10 seconds.

6.3.19.3.2 On K-148 enter the following:

Press ERR RST
VERB 44 ENTR
VERB 41 NOUN 72 ENTR
+00000 ENTR

+00100 ENTR
VERB 04 NOUN 06 shall flash
Verify Row 2 = 00002
VERB 33 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00001 ENTR

Verify RR CDU Fail and Tracker Alarm come ON in approximately 10 seconds.

6.3.19.3.3 On K-148 enter the following:

Press ERR RST
VERB 44 ENTR
VERB 41 NOUN 72 ENTR
+03375 ENTR
+00000 ENTR
VERB 04 NOUN 06 shall flash
Verify Row 2 = 00002
VERB 33 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00001 ENTR

Verify RR CDU Fail and Tracker Alarm come ON in approximately 10 seconds.

6.3.19.3.4 On K-148 enter the following:

Press ERR RST
VERB 44 ENTR
VERB 41 NOUN 72 ENTR
+00000 ENTR
+03375 ENTR
VERB 04 NOUN 06 shall flash
Verify Row 2 = 00002
VERB 33 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00001 ENTR

Verify RR CDU Fail and Tracker Alarm come ON in approximately 10 seconds.

6.3.19.3.5 On K-148 enter the following:

Press ERR RST
VERB 44 ENTR
VERB 41 NOUN 72 ENTR
+00000 ENTR
+00000 ENTR
VERB 44 ENTR

ADDENDUM III

DANCE G&N System Tests

Addition 1: Add new Paragraph 5.6.3 when DANCE flight ropes are installed in the S/C.

5.6.3 The DANCE program does not always automatically display computer error codes when a PROG alarm occurs. If error code is desired, enter the following on K-148:

VERB 06 NOUN 09 ENTR

R1 = First failure alarm code.

R2 = Second failure alarm code.

R3 = Third failure alarm code.

If more than three alarm codes occur, R3 = 4XXXX.

Addition 2: Replace FIGURE I with the following when DANCE ropes are installed in the S/C.

Paragraph No.	Test Title
6.3.1	Standby Power in Test
6.3.2	Alarms and Interrupts Test
6.3.3	IMU Operator Power On Test
6.3.4	Temperature Control Verification
6.3.5	PGNCS Power Supply Test
6.3.6	IMU Operational Test
6.3.7	PGNCS Operational Test
6.3.8	IRIG Scale Factor Test
6.3.9	IMU Performance Test
6.3.10	LGC Voltage Margin Test
6.3.11	LGC Clock Frequency Test
6.3.12	Gimbal Friction Test
6.3.13	Stabilization Loop Response Test
6.3.15	AOT Functional Performance Test
6.3.16	Flight Rope Fixed Memory Bank Sum Check
6.3.17	LGC Clock Alignment Test

G&N TESTS

FIGURE 1

Addition 3: Replace Paragraph 6.2.2.4.1 with the following when DANCE ropes are installed in the S/C.

6.2.2.4.1 On K-148, enter the following:

VERB 21 NOUN 01 ENTR
00034 ENTR
00000 ENTR
Verify GIMBAL LOCK light and PGNS CAUTION light OFF
VERB 21 NOUN 01 ENTR
01037 ENTR
40000 E NTR
Verify NO ATT OFF

Addition 4: The following procedure replaces Paragraph 6.2.4 when DANCE ropes are installed in the S/C.

6.2.4 General Turn-On Procedure.

6.2.4.1 This step shall be effective only after having completed the initial turn-on procedures.

6.2.4.2 Proper coolant flow shall be verified.

6.2.4.3 Depress +28-VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11 to supply IMU STANDBY power. Record time.

6.2.4.4 Depress +28 VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11 to supply LGC OPERATE power. The Restart lamp may come on; if it does, press RSET on the DSKY.

6.2.4.5 On K-148, enter the following:

VERB 36 ENTR

6.2.4.6 Verify K-START tape F07L003-KXXXXX-00 LM Self-Check Test is on the K-START tape reader.

6.2.4.7 Start tape reader.

6.2.4.8 When tape reader stops, verify:

R1 = +07292
R2 = +XXXXX tape number
R3 = -00000 tape Rev. No.

6.2.4.9 Start tape reader.

6.2.4.10 When tape reader stops, verify:

R1 = 00101

6.2.4.11 Start tape reader

6.2.4.12 Monitor DSKY until R2 (SCOUNT+1) increments twice. If an error is detected, the PROG CAUTION lamp on the DSKY shall light.

6.2.4.13 On K-148, enter the following to turn off Self-Check:

VERB 21 NOUN 27 ENTR
00000 ENTR
VERB 34 ENTR

6.2.4.14 CAUTION: LGC OPERATE and IMU STANDBY power must have been applied a minimum of two hours before energizing the IMU OPERATE circuit breaker in Step 6.2.4.19, unless all of the following conditions are met:

IF: 1. The G&N System has previously been in Standby Mode at least two hours and subsequently been in Operate Mode, AND

2. The gimbals are placed in a parked position prior to shutdown, AND

3. The shutdown period did not exceed 5 days, AND

4. The Spacecraft or IMU have not been moved in any way during the shutdown period.

THEN: The two-hour Standby Mode operation requirement is reduced to 15 minutes.

6.2.4.15 The G&N System is defined as being in Standby Mode when LGC OPERATE and IMU STANDBY power is applied and IMU OPERATE power is off. The inertial components shall have suspension power in Standby Mode.

6.2.4.16 The G&N System is defined as being in Operate Mode when LGC OPERATE, IMU STANDBY and IMU OPERATE power is applied to the system.

6.3.1.5 LGC Operational Tests

6.3.1.5.1 LGC Self-Check.

6.3.1.5.1.1 On K-148, enter the following:

VERB 36 ENTR (Do not restart Computer Activity Program)

6.3.1.5.1.2 Verify K-START tape F07L003-K105XX-00 LM Self-Check Test is on the K-START tape reader.

6.3.1.5.1.3 Start tape reader.

6.3.1.5.1.4 When tape reader stops, verify:

R1 = +07292
R2 = +105xx (tape number)
R3 = -00000 (tape revision)

6.3.1.5.1.5 Load E-Memory Program.

6.3.1.5.1.5.1 Start tape reader.

6.3.1.5.1.5.2 When tape reader stops, verify R1 - 00101.

6.3.1.5.1.6 Initiate Self-Check

6.3.1.5.1.6.1 Start Tape reader.

6.3.1.5.1.6.2 When R2 = 00002, stop the LGC Self-Check by entering the following in K-148:

VERB 21 NOUN 27 ENTR
00000 ENTR

6.3.1.5.2 DSKY Check.

6.3.1.5.2.1 Start tape reader.

6.3.1.5.2.2 All the electroluminescent elements (PROG, VERB, NOUN, and Row 1, Row 2, Row 3) shall display the decimal number nine (9). Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's

h. 2's
i. 1's
j. 0's
k. Minus signs in Row's 1, 2, 3
l. VERB-NOUN Flashing
m. COMP ACTY

On concurrently for 5 seconds.

n. Plus signs in Row's 1, 2, 3
o. VERB-NOUN Flashing
p. COMP ACTY

On concurrently for 5 seconds.

6.3.1.5.2.3 On K-148, enter the following:

VERB 21 NOUN 27 ENTR
00000 ENTR

6.3.1.5.2.4 The DSKY pushbuttons shall be checked by entering:

VERB 25 NOUN 01 ENTR
03375 ENTR
+00123 ENTR
-00456 ENTR
-00789 DO NOT PRESS ENTR

The DSKY shall display +00123 in Row 1, -00456 in Row 2, and -00789 in Row 3. Press CLR pushbutton three times on DSKY. Observe that Row 1, Row 2 and Row 3 are blank.

6.3.1.5.2.5 On the DSKY, enter the following sequence:

VERB 16 NOUN 20 ENTR
VERB ENTR
Verify KEY REL Flashing
Press KEY REL KEY REL shall extinguish

6.3.1.5.3 Lamp Test.

6.3.1.5.3.1 Initiate the Lamp Test by entering in the DSKY:

VERB 35 ENTR

6.3.1.5.3.2 The following DSKY displays shall illuminate for approximately 5 seconds:

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP

On concurrently for approximately 5 seconds

6.3.1.5.6.1 On K-148, enter the following:

VERB 37 ENTR
06 ENTR

Observe VERB 50 NOUN 25 flashing.
R1 = 00062 (switch LGC power down)

6.3.1.5.6.2 On DSKY, depress PRO pushbutton for approximately 3 seconds.

6.3.1.5.6.3 Verify STBY status indicator lamp is ON.

6.3.1.5.6.4 On the CRT, verify the 3.2 KC 28V Supply (CG 1331) is between 28.04 and 29.16V RMS.

6.3.1.5.6.5 On DSKY, depress PRO pushbutton for approximately 3 seconds to return to LGC Operate Mode.

6.3.1.5.6.6 Verify STBY status indicator lamp is OFF. RESTART light may be ON. Verify LGC WARNING is OFF and PGNCS CAUTION is ON. VERB 37 will flash.

6.3.1.5.6.7 On DSKY enter the following:

VERB 36 ENTR

6.3.1.5.7 Standby/Proceed Check.

6.3.1.5.7.1 On the DSKY, press and hold the PRO pushbutton, Verify CHAN 32 on CRT displays 57777.

Addition 6: The following procedure replaces Paragraph 6.3.6 when DANCE ropes are installed in the S/C.

NOTE: Manual DSKY entries during this test may result in a test abort.

6.3.6 IMU Operational Test

6.3.6.1 Verify K-START tape F07L003-K10531-00 LM G/N OPCHK is on K-START tape reader.

6.3.6.1.1 Start tape reader.

6.3.6.1.2 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +07292
b. R2 = +10530
c. R3 = -00000

6.3.6.2 E-Memory Program Load and Sum Check.

6.3.6.2.1 Start tape reader.

6.3.6.2.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00101.

6.3.6.3 Local g Measurement.

6.3.6.3.1 Start tape reader.

6.3.6.3.2 In approximately 10 minutes, VERB 23 NOUN 26 shall flash.

6.3.6.3.3 From the CRT DSKY display read and record Row 1 and Row 2 (local gravity whole and fractional, respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.3.6.4 Horizontal Earth Rate Measurement

6.3.6.4.1 Press PRO pushbutton on DSKY.

6.3.6.4.2 From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.3.6.5 Enter the following on K-148:

VERB 36	ENTR Wait 10 seconds
VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR

Addition 7: The following procedure replaces Paragraph 6.3.7 when DANCE ropes are installed in the S/C.

6.3.7 Semi-Automatic Mode Test

6.3.7.1 Verify K-START Tape F07L003-K10530-00 LM Semi-Automatic Mode Test is on K-START tape reader.

6.3.7.1.1 Start tape reader.

6.3.7.1.2 When tape reader stops verify the following on CRT DSKY

a. R1 = +07292
b. R2 = +10530
c. R3 = -00000

6.3.7.2 E-Memory Program Load

6.3.7.2.1 Start tape reader.

6.3.7.2.2 When tape reader stops verify the following on CRT DSKY:

R1 = 00101

6.3.7.3 Command Accuracy 0°.

6.3.7.3.1 Start tape reader.

6.3.7.3.2 When tape stops verify that CRT DSKY R1 indicates 00201. Wait 15 seconds.

6.3.7.3.3 Read and record CRT IMU Gimbal angles. The indications shall be 000±003 degrees.

6.3.7.3.4 Read and record CRT CDU angle indications. The indications shall be +000.00±000.30.

6.3.7.4 Command Accuracy 45°.

6.3.7.4.1 Start tape reader.

6.3.7.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00301. Wait 5 seconds.

6.3.7.4.3 Read and record CRT IMU Gimbal angles. The indications shall be 045±003 degrees.

6.3.7.4.4 Read and record CRT CDU angle indications. Indications shall be +045.00±000.30.

6.3.7.5 CDU Repeating Accuracy 45°

6.3.7.5.1 Start the tape reader.

6.3.7.5.2 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77774 and 00003.

6.3.7.6 Command Accuracy 90°.

6.3.7.6.1 Start tape reader.

6.3.7.6.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00501. Gimbal Lock lamp will be lighted. Wait 5 seconds.

6.3.7.6.3 Read and record CRT indication of IMU Gimbal angles. The indications shall be 000±003 degrees.

6.3.7.6.4 Read and record CRT CDU angle indications. Indications shall be +090.00±000.30.

6.3.7.7 Command Accuracy 135°.

6.3.7.7.1 Start tape reader.

6.3.7.7.2 When tape reader stops verify CRT DSKY Row 1 indicates 00601. Wait 5 seconds.

6.3.7.7.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 135±003 degrees.

6.3.7.7.4 Read and record CRT CDU angle indications. Indications shall be +135.00±000.30.

6.3.7.8 CDU Repeating Accuracy 135°.

6.3.7.8.1 Start tape reader.

6.3.7.8.2 When tape reader stops verify CRT DSKY Row 1 indicates 00701. Wait 10 seconds, verify Gimbal Lock lamp on DSKY is not lighted.

6.3.7.8.3 Start tape reader.

6.3.7.8.4 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 will flash. Read and record CRT DSKY Row 1, 2 and 3 indications. Recorded values shall be between 77774 and 00003.

6.3.7.9 Plus Gimbal Lock Test.

6.3.7.9.1 Start tape reader.

6.3.7.9.2 When tape reader stops wait approximately 10 seconds. Verify CRT DSKY Row 1 indicates 01101. Verify Gimbal Lock lamp is lighted.

6.3.7.10 Command Accuracy 225°.

6.3.7.10.1 Start tape reader.

6.3.7.10.2 When tape reader stops verify CRT DSKY Row 1 indicates 01201. Gimbal Lock lamp will be lighted. Wait 15 seconds.

6.3.7.10.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 225±003 degrees.

6.3.7.10.4 Read and record CRT CDU angle indications. Indications shall be +225.00±000.30.

6.3.7.11 CDU Command Rate Test

6.3.7.11.1 Start tape reader.

6.3.7.11.2 When tape reader stops verify CRT DSKY display Row 1 indicates 01301. Wait 10 seconds. Verify IMU Gimbals are at approximately 0°.

6.3.7.11.3 Middle Gimbal Rate Test

6.3.7.11.3.1 Start tape reader.

6.3.7.11.3.2 When tape reader stops immediately verify display of 01401 in Row 1 of CRT DSKY display. In approximately 12 seconds VERB 23 NOUN 26 shall flash. The Gimbal Lock lamp shall be lit. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.3.7.11.4 Inner Gimbal Rate Test

6.3.7.11.4.1 Start tape reader.

6.3.7.11.4.2 Approximately 12 seconds after the tape reader stops VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.3.7.11.5 Outer Gimbal Rate Test.

6.3.7.11.5.1 Start tape reader.

6.3.7.11.5.2 Approximately 12 seconds after the tape reader stops VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.3.7.11.6 Start tape reader.

6.3.7.11.6.1 Wait 15 seconds. Verify IMU Gimbals are at approximately 0°.

6.3.7.12 Command Accuracy 315°.

6.3.7.12.1 Start tape reader.

6.3.7.12.2 When tape reader stops verify CRT DSKY Row 1 indicates 01501.

6.3.7.12.3 Read and record CRT IMU Gimbal Angles. Indication shall be 315±003 degrees.

6.3.7.12.4 Read and record CRT CDU angle indications. Indications shall be +315.00±000.30.

6.3.7.13 CDU Repeating Accuracy 315°.

6.3.7.13.1 Start tape reader.

6.3.7.13.2 Approximately 5 seconds after the tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2 and 3 indications. Recorded values shall be between 77774 and 00003.

6.3.7.14 Minus Gimbal Lock Test.

6.3.7.14.1 Start tape reader.

6.3.7.14.2 When tape reader stops verify CRT DSKY Row 1 indicates 01701. Verify Gimbal Lock lamp is lighted after approximately 5 seconds.

6.3.7.15 CDU Repeating Accuracy 225°.

6.3.7.15.1 Start tape reader.

6.3.7.15.2 When tape reader stops verify CRT DSKY Row 1 indicates +00016. Wait 10 seconds before continuing.

6.3.7.15.3 Start tape reader.

6.3.7.15.4 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 will flash. Read and record CRT DSKY Row 1, 2 and 3 indications. Recorded values shall be between 77774 and 00003.

6.3.7.16 OG CDU Fine Fail Test.

6.3.7.16.1 Start tape reader.

6.3.7.16.2 When tape reader stops verify CRT DSKY Row 1 indicates 02101.

6.3.7.16.3 Start tape reader.

6.3.7.16.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp is lit and Channel 30 on CRT indicates 33XXX.

6.3.7.16.5 Start tape reader.

6.3.7.16.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out and Channel 30 on CRT indicates 37XXX.

6.3.7.17 IG CDU Fine Fail Test

6.3.7.17.1 Start tape reader.

6.3.7.17.2 When tape reader stops verify CRT DSKY Row 1 indicates 02201.

6.3.7.17.3 Start tape reader.

6.3.7.17.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp is lit and Channel 30 on CRT indicates 33XXX.

6.3.7.17.5 Start tape reader.

6.3.7.17.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out and Channel 30 on CRT indicates 37XXX.

6.3.7.18 MG CDU Fine Fail Test.

6.3.7.18.1 Start tape reader.

6.3.7.18.2 When tape reader stops verify CRT DSKY Row 1 indicates 02301.

6.3.7.18.3 Start tape reader.

6.3.7.18.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp is lit and Channel 30 on CRT indicates 33XXX.

6.3.7.18.5 Start tape reader.

6.3.7.18.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out and Channel 30 on CRT indicates 37XXX.

6.3.7.19 OG CDU Coarse Fail Test

6.3.7.19.1 Start tape reader.

6.3.7.19.2 When tape reader stops verify CRT DSKY Row 1 indicates 02401.

6.3.7.19.3 Start tape reader.

6.3.7.19.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp is lit and Channel 30 on CRT indicates 33XXX.

6.3.7.19.5 Start tape reader.

6.3.7.19.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out and Channel 30 on CRT indicates 37XXX.

6.3.7.20 IG CDU Coarse Fail Test

6.3.7.20.1 Start tape reader.

6.3.7.20.2 When tape reader stops verify CRT DSKY Row 1 indicates 02501.

6.3.7.20.3 Start tape reader.

6.3.7.20.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp is lit and Channel 30 on CRT indicates 33XXX.

6.3.7.20.5 Start tape reader.

6.3.7.20.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out and Channel 30 on CRT indicates 37XXX.

6.3.7.21 MG CDU Coarse Fail Test

6.3.7.21.1 Start tape reader.

6.3.7.21.2 When tape reader stops verify CRT DSKY Row 1 indicates 02601.

6.3.7.21.3 Start tape reader.

6.3.7.21.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp is lit and Channel 30 on CRT indicates 33XXX.

6.3.7.21.5 Start tape reader.

6.3.7.21.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out and Channel 30 on CRT indicates 37XXX.

6.3.7.22 FDAI Linearity Test.

6.3.7.22.1 Start tape reader.

6.3.7.22.2 When tape reader stops verify that CRT DSKY Row 1 indicates 02701. Wait 5 seconds.

6.3.7.22.3 Start tape reader.

6.3.7.22.14 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates -00016.
PITCH ATT ERROR is between -14.4 and -17.6 DEG (GG 2219)
YAW ATT ERROR is between -14.4 and -17.6 DEG (GG 2249)
ROLL ATT ERROR is between -14.4 and -17.6 DEG (GG 2279)

6.3.7.22.15 Start tape reader.

6.3.7.22.16 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates -00017.
PITCH ATT ERROR is between -15.3 and -18.7 DEG (GG 2219)
YAW ATT ERROR is between -15.3 and -18.7 DEG (GG 2249)
ROLL ATT ERROR is between -15.3 and -18.7 DEG (GG 2279)

6.3.7.23 On K-148 enter VERB 34 ENTER

The proper operation of the IMU CAGE function (consisting of steps 6.3.7.23.1 through 6.3.7.23.7) need be performed only once during the initial PGNCS Operational Test and omitted from subsequent testing of test 6.3.7.

6.3.7.23.1 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00500 ENTR
+00500 ENTR
+00500 ENTR

6.3.7.23.2 On the CRT, verify all IMU gimbal angles indicate between 003 and 007 deg.

6.3.7.23.3 On analog recorder, monitor the following signals:

Signal No.	Signal Name
a. GG 2136	MG Servo Error Total
b. GG 2106	IG Servo Error Total
c. GG 2166	OG Servo Error Total
d. GG 2112	IG 1X Resolver Sine
e. GG 2172	OG 1X Resolver Sine
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1% 800 cps

6.3.7.23.4 Start analog recorder to a chart speed of 5 mm/sec.

6.3.7.23.5 On LEM Cabin Panel 4, hold IMU CAGE momentary toggle switch in the ON position. (Do not release).

6.3.7.23.6 On analog recorder, verify the 1X Resolver Sine signals (GG 2112, GG 2172, GG 2142) null out to less than 0.5 VRMS. Release IMU CAGE switch to the OFF position. Disregard any momentary transients on the 1X Resolver Sine signals when the switch is released. Any sustained oscillations shall be cause for immediate removal of IMU Operate Power.

6.3.7.23.7 On the CRT, verify all IMU gimbal angles indicate between 357 and 003.

6.3.7.24 Stop analog recorder.

6.3.7.24.1 On K-148 enter the following:

VERB 36 ENTR
VERB 43 ENTR
+01700 ENTR
+00600 ENTR
-01700 ENTR

On CRT, verify the following:

YAW ATT ERROR is between +15.3 and +18.7 DEG (GG 2249)
PITCH ATT ERROR is between +05.5 and +06.6 DEG (GG 2219)
ROLL ATT ERROR is between -15.3 and -18.7 DEG (GG 2279)

6.3.7.25 On K-148 enter the following sequence:

VERB 36 ENTR
VERB 41 NOUN 20 ENTR
+00800 ENTR
+00100 ENTR
-00800 ENTR

6.3.7.26 On CRT verify the following:

IG 1X Resolver Sin (11°) is between +06.5 and +09.6 DEG (GG 2121)
MG 1X Resolver Sin (11°) is between +00.5 and +02.5 DEG (GG 2151)
OG 1X Resolver Sin (11°) is between -06.5 and -09.5 DEG (GG 2181)

6.3.7.27 On K-148 enter the following:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

Addition 8: The following procedure replaces paragraph 6.3.8 when DANCE flight ropes are installed in the S/C.

6.3.8 IRIG Scale Factor Test.

6.3.8.1 Verify K-START tape F07L003-K00XXX-00 LM IRIG Scale Factor Test is on the K-START tape reader.

6.3.8.2 On K-148 enter the following:

VERB 36 ENTR

6.3.8.3 E-Memory Program Load.

6.3.8.3.1 Start tape reader.

6.3.8.3.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00000.

6.3.8.4 Test Position Data Load (+X S.F.)

6.3.8.4.1 Start tape reader.

6.3.8.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.3.8.4.3 On K-148 enter the following:

VERB 25 NOUN 26 ENTR
04001 ENTR
01430 (STARTING ADDRESS) ENTR
16005 (BBANK) ENTR
VERB 30 ENTR

6.3.8.4.4 When VERB 06 NOUN 41 flashes verify the following on the CRT DSKY display:

R2 = XX.XXX Site Latitude (See Table 1)
R3 = XXX.XX Nav Base Azimuth

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

If R3 requires correction, enter VERB 23 ENTR into K-148 and enter correct azimuth.

6.3.8.4.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.4.6 In approximately 100 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001).

6.3.8.5 **Test Position Data Load (+Y S.F.)**

6.3.8.5.1 Start tape reader.

6.3.8.5.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.3.8.5.3 On K-148 enter the following:

VERB 25 NOUN 26 ENTR
04001 ENTR
01430 (STARTING ADDRESS) ENTR
16005 (BBANK) ENTR
VERB 30 ENTR

6.3.8.5.4 When VERB 06 NOUN 41 flashes verify the following on the CRT DSKY display:

R2 = XX.XXX Site Latitude (See Table I)
R3 = XXX.XX Nav Base Azimuth

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

If R3 requires correction, enter VERB 23 ENTR into K-148 and enter correct azimuth.

6.3.8.5.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.5.6 In approximately 100 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002).

6.3.8.6 **Test Position Data Load (+Z S.F.)**

6.3.8.6.1 Start tape reader.

6.3.8.6.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.3.8.6.3 On K-148 enter the following:

VERB 25 NOUN 26 ENTR
04001 ENTR
01430 (STARTING ADDRESS) ENTR
16005 (BBANK) ENTR
VERB 30 ENTR

6.3.8.6.4 When VERB 06 NOUN 41 flashes verify the following on the CRT DSKY display:

R2 = XX.XXX Site Latitude (See Table 1)
R3 = XXX.XX Nav Base Azimuth

If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

If R3 requires correction enter VERB 23 ENTR into K-148 and enter correct azimuth.

6.3.8.6.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.6.6 In approximately 100 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.3.8.7 Test Position Data Load (-X S.F.)

6.3.8.7.1 Start tape reader.

6.3.8.7.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.3.8.7.3 On K-148 enter the following:

VERB 25 NOUN 26 ENTR
04001 ENTR
01430 (STARTING ADDRESS) ENTR
16005 (BBANK) ENTR
VERB 30 ENTR

6.3.8.7.4 When VERB 06 NOUN 41 flashes verify the following on the CRT DSKY display:

R2 = XX.XXX Site Latitude (See Table 1)
R3 = XXX.XX Nav Base Azimuth

If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

If R3 requires correction enter VERB 23 ENTR into K-148 and enter correct azimuth.

6.3.8.7.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.7.6 In approximately 100 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001).

6.3.8.8 Test Position Data Load (-Y S.F.)

6.3.8.8.1 Start tape reader.

6.3.8.8.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.3.8.8.3 On K-148 enter the following:

VERB 25 NOUN 26 ENTR
04001 ENTR
01430 (STARTING ADDRESS) ENTR
10006 BBANK ENTR
VERB 30 ENTR

6.3.8.8.4 When VERB 06 NOUN 41 flashes verify the following on the CRT DSKY display:

R2 = XX.XXX Site Latitude (See Table I)
R3 = XXX.XX Nav Base Azimuth

If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

If R3 requires correction enter VERB 23 ENTR into K-148 and enter correct azimuth.

6.3.8.8.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.8.6 In approximately 100 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002).

6.3.8.9 Test Position Data Load (-Z S.F.)

6.3.8.9.1 Start Tape reader.

6.3.8.9.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.3.8.9.3 On K-148 enter the following:

VERB 25 NOUN 26 ENTR
04001 ENTR
01430 (STARTING ADDRESS) ENTR
16005 BBANK ENTR
VERB 30 ENTR

6.3.8.9.4 When VERB 06 NOUN 41 flashes verify the following on the CRT DSKY display:

R2 = XX.XXX Site Latitude (See Table I)
R3 = XXX.XX Nav Base Azimuth

If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

If R3 requires correction enter VERB 23 ENTR into K-148 and enter correct azimuth.

6.3.8.9.5 In approximately 100 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003).

6.3.8.10 Terminate this test by entering the following into K-148:

VERB 36 ENTR
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.8.11 The Scale Factor Error for each of the 6 positions shall be 0±1750 PPM.

Addition 9: The following procedure replaces Paragraph 6.3.9 when DANCE flight ropes are installed in the S/C.

6.3.9 IMU Performance Test. A reference data sheet is provided at the end of this section to aid in data reduction.

6.3.9.1 Insure that IMU Operate power and LGC Operate power has been supplied for a minimum of one hour and that the IMU is not in a Gimbal Lock condition.

6.3.9.2 On CRT, monitor and record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.3.9.3 Verify K-START tape F07L003-K00XXX-00 IMU Performance Test is on the tape reader.

6.3.9.4 Start the tape reader. Verify DSKY is blank. Wait 10 seconds.

6.3.9.5 Start the tape reader. After 15 seconds, verify IMU is coarse aligned to zero degrees.

6.3.9.6 E-Memory Program Load.

6.3.9.6.1 Start the tape reader. When tape reader stops, verify the following DSKY display:

Row 1 13745
Row 3 2575

6.3.9.7 Test Position +00001.

6.3.9.7.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.7.1.1 Start tape reader.

6.3.9.7.1.2 When tape reader stops, verify DSKY Row 1 displays +00001.

6.3.9.7.2 E-Memory Test Position Initialization Sum Check.

6.3.9.7.2.1 Start tape reader.

6.3.9.7.2.2 When tape reader stops verify DSKY Row 1 displays +00001.

6.3.9.7.3 Test Initialization.

6.3.9.7.3.1 Start tape reader.

6.3.9.7.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Row 1 XXX.XX (N.B. Azimuth)
Row 2 XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct N.B. Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.7.4 Horizontal Drift Test.

6.3.9.7.4.1 Start tape reader.

6.3.9.7.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.7.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.7.5 PIPA Scale Factor Test.

6.3.9.7.5.1 Start tape reader.

6.3.9.7.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec.)

6.3.9.7.6 Test Termination.

6.3.9.7.6.1 Start tape reader.

6.3.9.7.6.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.8 Test Position 00002.

6.3.9.8.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.8.1.1 Start tape reader.

6.3.9.8.1.2 When tape reader stops, verify DSKY Row 1 displays +00002.

6.3.9.8.2 E-Memory Test Position Initialization Sum Check.

6.3.9.8.2.1 Start tape reader.

6.3.9.8.2.2 When tape reader stops, verify DSKY Row 1 displays +00002.

6.3.9.8.3 Test Initialization.

6.3.9.8.3.1 Start tape reader.

6.3.9.8.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Row 1 XXX.XX (N.B. Azimuth)
Row 2 XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct N.B. Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.8.4 Horizontal Drift Test

6.3.9.8.4.1 Start tape reader.

6.3.9.8.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.8.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.8.5 PIPA Scale Factor Test.

6.3.9.8.5.1 Start tape reader.

6.3.9.8.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec.)

6.3.9.8.6 Vertical Drift Test.

6.3.9.8.6.1 Start tape reader.

6.3.9.8.6.2 In approximately 67 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.3.9.8.7 Test Termination.

6.3.9.8.7.1 Start tape reader.

6.3.9.8.7.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.9 Test Position +00003.

6.3.9.9.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.9.1.1 Start tape reader.

6.3.9.9.1.2 When tape reader stops, verify DSKY Row 1 displays +00003.

6.3.9.9.2 E-Memory Test Position Initialization Sum Check.

6.3.9.9.2.1 Start tape reader.

6.3.9.9.2.2 When tape reader stops, verify DSKY Row 1 displays +00003

6.3.9.9.3 Test Initialization.

6.3.9.9.3.1 Start tape reader.

6.3.9.9.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Row 1 XXX.XX (N.B. Azimuth)
Row 2 XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct N.B. Azimuth)
XX.XXX	(Correct Site Latitude)

6.3.9.9.4 Horizontal Drift Test.

6.3.9.9.4.1 Start tape reader.

6.3.9.9.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.9.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.9.5 PIPA Scale Factor Test.

6.3.9.9.5.1 Start tape reader.

6.3.9.9.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.3.9.9.6 Test Termination.

6.3.9.9.6.1 Start tape reader.

6.3.9.9.6.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.10 Test Position +00004

6.3.9.10.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.10.1.1 Start tape reader.

6.3.9.10.1.2 When tape reader stops, verify DSKY Row 1 displays +00004.

6.3.9.10.2 E-Memory Test Position Initialization Sum Check.

6.3.9.10.2.1 Start tape reader.

6.3.9.10.2.2 When a tape reader stops, verify DSKY Row 1 displays +00004.

6.3.9.10.3 Test Initialization.

6.3.9.10.3.1 Start Tape reader.

6.3.9.10.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Row 1	XXX.XX (N.B. Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct N.B. Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.10.4 Horizontal Drift Test.

6.3.9.10.4.1 Start tape reader.

6.3.9.10.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.10.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.3.9.10.5 PIPA Scale Factor Test.

6.3.9.10.5.1 Start tape reader.

6.3.9.10.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec.)

6.3.9.10.6 Vertical Drift Test.

6.3.9.10.6.1 Start tape reader.

6.3.9.10.6.2 In approximately 67 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.3.9.10.7 Test Termination.

6.3.9.10.7.1 Start tape reader.

6.3.9.10.7.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.11 Test Position +00005.

6.3.9.11.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.11.1.1 Start tape reader.

6.3.9.11.1.2 When tape reader stops, verify DSKY Row 1 displays +00005.

6.3.9.11.2 E-Memory Test Position Initialization Sum Check.

6.3.9.11.2.1 Start tape reader.

6.3.9.11.2.2 When tape reader stops, verify DSKY Row 1 displays +00005.

6.3.9.11.3 Test Initialization.

6.3.9.11.3.1 Start tape reader.

6.3.9.11.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Row 1	XXX.XX (N.B. Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct N.B. Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.11.4 PIPA Scale Factor Test.

6.3.9.11.4.1 Start tape reader. Record time.

6.3.9.11.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM, and GIMBAL LOCK lamps shall be lit.

6.3.9.11.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.3.9.11.5 Test Termination.

6.3.9.11.5.1 Start tape reader.

6.3.9.11.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.12 Test Position +00006.

6.3.9.12.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.12.1.1 Start tape reader.

6.3.9.12.1.2 When tape reader stops, verify DSKY Row 1 displays +00006.

6.3.9.12.2 E-Memory Test Position Initialization Sum Check

6.3.9.12.2.1 Start tape reader.

6.3.9.12.2.2 When tape reader stops verify DSKY Row 1 displays +00006.

6.3.9.12.3 Test Initialization.

6.3.9.12.3.1 Start tape reader.

6.3.9.12.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Row 1	XXX.XX (N. B. Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct N. B. Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.12.4 PIPA Scale Factor Test.

6.3.9.12.4.1 Start tape reader. Record time.

6.3.9.12.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM and GIMBAL LOCK lamps shall be lit.

6.3.9.12.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.3.9.12.5 Test Termination.

6.3.9.12.5.1 Start tape reader.

6.3.9.12.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.13 Test Position +00007.

6.3.9.13.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.13.1.1 Start tape reader.

6.3.9.13.1.2 When tape reader stops verify DSKY Row 1 displays +00007.

6.3.9.13.2 E-Memory Test Position Initialization Sum Check.

6.3.9.13.2.1 Start tape reader.

6.3.9.13.2.2 When tape reader stops, verify DSKY Row 1 displays +00007.

6.3.9.13.3 Test Initilization.

6.3.9.13.3.1 Start tape reader.

6.3.9.13.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Row 1	XXX.XX (N.B. Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct N.B. Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.13.4 Horizontal Drift Test.

6.3.9.13.4.1 Start tape reader.

6.3.9.13.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.13.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.3.9.13.5 Test Termination.

6.3.9.13.5.1 Start tape reader.

6.3.9.13.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.14 Test Position +00008.

6.3.9.14.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.14.1.1 Start tape reader.

6.3.9.14.1.2 When tape reader stops, verify DSKY Row 1 displays +00008.

6.3.9.14.2 E-Memory Test Position Initialization Sum Check.

6.3.9.14.2.1 Start tape reader.

6.3.9.14.2.2 When tape reader stops, verify DSKY Row 1 displays +00008.

6.3.9.14.3 Test Initialization.

6.3.9.14.3.1 Start tape reader.

6.3.9.14.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Row 1	XXX.XX (N.B. Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct N.B. Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.14.4 Horizontal Drift Test.

6.3.9.14.4.1 Start tape reader.

6.3.9.14.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.14.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.14.5 Test Termination.

6.3.9.14.5.1 Start tape reader.

6.3.9.14.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.15 Test Position +00009.

6.3.9.15.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.15.1.1 Start tape reader.

6.3.9.15.1.2 When tape reader stops, verify DSKY Row 1 displays +00009.

6.3.9.15.2 E-Memory Test Position Initialization Sum Check.

6.3.9.15.2.1 Start tape reader.

6.3.9.15.2.2 When tape reader stops, verify DSKY Row 1 displays +00009.

6.3.9.15.3 Test Initialization.

6.3.9.15.3.1 Start tape reader.

6.3.9.15.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Row 1	XXX.XX (N.B. Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct N.B. Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.15.4 Horizontal Drift Test.

6.3.9.15.4.1 Start tape reader.

6.3.9.15.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.15.4.3 In approximately 14 minutes, VERB 06 NOUN 96 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.15.5 Test Termination.

6.3.9.15.5.1 Start tape reader.

6.3.9.15.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.16 Test Position +00010.

[illegible]

6.3.9.16.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.16.1.1 Start tape reader.

6.3.9.16.1.2 When tape reader stops, verify DSKY Row 1 displays +00010.

6.3.9.16.2 E-Memory Test Position Initialization Sum Check.

6.3.9.16.2.1 Start tape reader.

6.3.9.16.2.2 When tape reader stops, verify DSKY Row 1 displays +00010.

6.3.9.16.3 Test Initialization.

6.3.9.16.3.1 Start tape reader.

6.3.9.16.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Row 1	XXX.XX (N.B. Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct N.B. Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.16.4 Horizontal Drift Test.

6.3.9.16.4.1 Start tape reader.

6.3.9.16.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.16.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.16.5 Test Termination

6.3.9.16.5.1 Start tape reader.

6.3.9.16.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.17 On CRT, record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.3.9.18 On K-148, enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.9.19 Calculations.

NOTE: Use Post Vibration or System Test data points only.

6.3.9.19.1 Y PIPA Data Correction Calculation.

6.3.9.19.1.1 From the uplink file tape, the compressed data tape or the PCM tape, request a data reduction of the X and Z accelerometer ΔV counts (addresses 37 and 41, respectively) and the TIME 2 and TIME 1 registers (addresses 24 and 25, respectively) for the period during which the Y PIPA test was being performed in Positions 5 and 6 of the IMU Performance test.

6.3.9.19.1.2 Perform the following calculations for Position 5.

$$G_5' = \frac{G_5}{\cos \theta}$$

where:

G_5 = Measured acceleration term (line k)

G_5' = Corrected acceleration term

$\cos \theta y_5 = 1 - \frac{1}{\theta 2 y_5}$ for small angles

$$\theta y_5 = \sqrt{\theta^2_{x5} + \theta^2_{z5}}$$

and:

$\theta_{z5} = (\Delta V_{x5} - \Delta V_x \text{ Bias}) (\text{S.F.}_x)/(\Delta T) (\text{local } g)$

$\theta_{x5} = (\Delta V_{z5} - \Delta V_z \text{ Bias}) (\text{S.F.}_z)/(\Delta T) (\text{local } g)$

and:

$V_x \text{ Bias} = (\text{X PIPA Bias}) (\Delta T) / \text{S.F.}_x$

$V_z \text{ Bias} = (\text{Z PIPA Bias}) (\Delta T) / \text{S.F.}_z$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.3.9.19.1.3 Perform the following calculations for Position 6.

$$G_6' = \frac{G_6}{\text{Cos } \theta y_6}$$

where:

G_6 = Measured acceleration term (line ℓ)

G_6' = Corrected acceleration term

$\text{Cos } \theta y_6 = 1 - \frac{1}{\theta^2 y_6}$ for small angles

$$\theta y_6 = \sqrt{\theta^2_{x6} + \theta^2_{z6}}$$

and:

$\theta_{z6} = (\Delta V_{x6} - \Delta V_x \text{ Bias}) (S.F._x) \;/\; (\Delta T) (\text{local } g)$

$\theta_{x6} = (\Delta V_{z6} - \Delta V_z \text{ Bias}) (S.F._z) \;/\; (\Delta T) (\text{local } g)$

and:

$V_x \text{ Bias} = (X \text{ PIPA Bias}) (\Delta T) \;/\; S.F._x$

$V_z \text{ Bias} = (Z \text{ PIPA Bias}) (\Delta T) \;/\; S.F._z$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.3.9.19.2 Obtain data from last IRIG and/or PIPA Test and fill in Data Sheet x_{i-1}.

6.3.9.19.3 Obtain data from second last IRIG and/or PIPA Test and fill in Data Sheet x_{i-2}.

6.3.9.19.4 Obtain data from third last IRIG and/or PIPA Test and fill in Data Sheet x_{i-3}.

6.3.9.19.5 Perform the following calculations for each item appearing on Data Sheet x_i and transfer all results to lines au through bi.

NOTE: See Paragraph 5.6 before continuing.

$$D_1 = \left| x_{i-1} - x_i \right|$$

$$D_2 = \left| x_{i-1} - x_i \right| + \left| x_{i-2} - x_{i-1} \right|$$

$$D_3 = \left| x_{i-3} - x_{i-2} \right| + \left| x_{i-2} - x_{i-1} \right| + \left| x_{i-1} - x_i \right|$$

DATA SHEET

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.3.9 7.4.3	+N BDY Transfer result to line af.	meru	( )___.__	a
6.3.9 7.5.2	+X PIPA Test Position +00001	cm/sec^2	( ) 0 0 ___. ( )_____	b
6.3.9 8.4.3	+N BDZ Position +00002 Transfer result to line ag.	meru	( )___.__	c
6.3.9 8.5.2	-X PIPA Test Position +00002	cm/sec^2	( ) 0 0 ___. ( )_____	d
6.3.9 8.6.2	-N BDX + ADIAX Position +00002	meru/g	( )___.__	e
6.3.9 9.4.3	-N BDX Position +00003 Multiply by -1 and transfer to line ah.	meru	( )___.__	f
6.3.9 9.5.2	+Z PIPA Test Position +00003	cm/sec^2	( ) 0 0 ___. ( )_____	g
6.3.9 10.4.3	+N BDY + ADSRAY Position +00004	meru/g	( )___.__	h
6.3.9 10.5.2	-Z PIPA Test Position +00004	cm/sec^2	( ) 0 0 ___. ( )_____	i
6.3.9 10.6.2	+N BDZ + ADIAZ Position +00004	meru	( )___.__	j

DATA SHEET (Cont)

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.3.9 11.4.3	+Y PIPA Test Position +00005	cm/sec^2	( ) 0 0 ___. ( ) _____	k
6.3.9 12.4.3	-Y PIPA Test Position +00006	cm/sec^2	( ) 0 0 ___. ( ) _____	l
6.3.9 13.4.3	-NBDX + .707 ADSRAX Position +00007	meru/g	( ) ___.__	m
6.3.9 14.4.3	-.707 (NBDZ + NBDY) +0.5 (ADIAZ - ADIAY) +0.5 (ADSRAY + ADSRAZ) Position +00008	meru/g		n
6.3.9 15.4.3	-NBDZ + .707 ADSRAZ Position +00009	meru/g		o
6.3.9 16.4.3	.707 (NBDY - NBDX) +0.5 (ADIAY - ADIAX) +0.5 (ADSRAX) Position +00010	meru/g		p

DATA SHEET

CALCULATION	PARAMETER	UNITS	
line e - line f = ( ) ___ . __ (-NBDX + ADIAX) - (-NBDX) Transfer result to line ai.	ADIAX	meru/g	q
line h - line a = ( ) ___ . __ (+NBDY + ADSRAY) - (-NBDY) Transfer result to line ai.	ADSRAY	meru/g	r
line j - line c = ( ) ___ . __ (+NBDZ + ADIAZ) - (NBDZ) Transfer result to line am.	ADIAZ	meru/g	s
(line m - line f) x 1.414 = ( ) ___ . __ (-NBDX +.707 ADSRAX) - (-NBDX) x 1.414 Transfer result to line ak.	ADSRAX	meru/g	t
(line o + line e) x 1.414 = ( ) ___ . __ (-NBDZ +.707 ADSRAZ + NBDZ) x 1.414 Transfer result to line aj.	ADSRAZ	meru/g	u
(line p - .707 line a - .707 line f +.5 line q - .5 line t) x 2 = ___ . __ [.707 (NBDY-NBDX) + .5 (ADIAY - ADIAX) +.5 ADSRAX - .707 (-NBDX) -.707 NBDY +.5 ADIAX - .5 ADSRAX] x 2 Transfer result to line al.	ADIAY	meru/g	v
line b - line d = ( )	PIPA X2G	cm/sec^2	w
line k - line l = ( )	PIPA X2G	cm/sec^2	x
line g - line i = ( )	PIPA X2G	cm/sec^2	y
1958.48 ÷ line w x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ao	X PIPA S.F.	cm/sec/pulse	z
1958.48 ÷ line x x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6, and transfer results to line ap.	Y PIPA S.F.	cm/sec/pulse	aa
1958.48 ÷ line y x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6, and transfer results to line aq.	Z PIPA S.F.	cm/sec/pulse	ab
1/2 (line b + line d) = ( ) __ . ___ Transfer results to line ar.	X PIPA Bias	cm/sec^2	ac
1/2 (line k + line l) = ( ) __ . ___ Transfer results to line as.	Y PIPA Bias	cm/sec^2	ad
1/2 (line g + line i) = ( ) __ . ___ Transfer results to line at.	Z PIPA Bias	cm/sec^2	ae

DATA SHEET (x_1)

PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
NBDY	meru	-15		+15			af
NBDZ	meru	-15		+15			ag
NBDX	meru	-15		+15			ah
ADSRAY	meru/g	-40		+40			ai
ADSRAZ	meru/g	-40		+40			aj
ADSRAX	meru/g	-40		+40			ak
ADIAX	meru/g	-100		+100			al
ADIAZ	meru/g	-100		+100			am
ADIAY	meru/g	-100		+100			an
X PIPA S.F. error from line z.	PPM	-1900		+1900			ao
Y PIPA S.F. error from line aa.	PPM	-1900		+1900			ap
Z PIPA S.F. error from line ab.	PPM	-1900		+1900			aq
X PIPA BIAS from line ac.	cm/sec^2	-3.1		+3.1			ar
Y PIPA Bias from line ad.	cm/sec^2	-3.1		+3.1			as
Z PIPA Bias from line ae.	cm/sec^2	-3.1		+3.1			at

DATA SHEET (x_{i-1})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET (x_{1-2})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S.F. error	PPM	
Y PIPA S.F. error	PPM	
Z PIPA S.F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET (x_{1-3})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S.F. error	PPM	
Y PIPA S.F. error	PPM	
Z PIPA S.F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET

PARAMETER	UNITS	D_1	MAX	D_2	MAX	D_3	MAX	
NBDY	meru		6		9		11	au
NBDZ	meru		6		9		11	av
NBDX	meru		6		9		11	aw
ADSRAY	meru/g		14		21		25	ax
ADSRAZ	meru/g		14		21		25	ay
ADSRAX	meru/g		14		21		25	az
ADIAX	meru/g		17		33		40	ba
ADIAZ	meru/g		17		33		40	bb
ADIAY	meru/g		17		33		40	bc
X PIPA S.F. error	PPM		400		500		600	bd
Y PIPA S.F. error	PPM		400		500		600	be
Z PIPA S.F. error	PPM		400		500		600	bf
X PIPA Bias	cm/sec^2		0.5		0.7		0.9	bg
Y PIPA Bias	cm/sec^2		0.5		0.7		0.9	bh
Z PIPA Bias	cm/sec^2		0.5		0.7		0.9	bi

Addition 10: The following procedure replaces Paragraph 6.3.10 when DANCE ropes are installed in the S/C.

6.3.10 LGC Voltage Margin Test

6.3.10.1 Initial Conditions.

6.3.10.1.1 Insure that the G&N System is in the Standby Mode.

6.3.10.1.2 On the CRT, verify the +28 VDC LGC OPERATE bus is between 24.5 and 33.5 vdc (GG 1520).

6.3.10.1.3 On Panel 5, set lighting override ANUN SW to OFF. Rotate the ANUN/NUM dimmer fully CCW.

6.3.10.2 Voltage Margin Determination

6.3.10.2.1 On the PSA Adapter Module (PSAAM) (410-31080), place INHIBIT VOLTAGE FAIL switch to ON.

CAUTION: The +4 vdc LGC supply voltage shall never be operated lower than +2.5 vdc or higher than +5.2 vdc (GG 1030.)

The +14 vdc LGC supply shall never be operated less than +8.5 vdc or higher than +17.0 vdc (GG 1020). LTG-ANUN/NUM control on Panel 5 shall be set to DIM during the performance of the Voltage Margin Test in order to avoid decreasing the operating life of the DSKY EL lamps.

NOTE: The flashing indication of the LGC supplies may be disregarded for this test. The charts in Table II may be used to determine approximate values for "XX.X" values of C-156 voltage dial settings corresponding to various power supply voltages.

6.3.10.2.2 Enter 0001 into R-155. Verify and execute.

6.3.10.2.3 Enter 1111 into R-154. Verify and execute.

6.3.10.2.4 Enter in C-156±XX.X001114. (Enter a value for XX.X which will adjust the +14V power supply (GG 1020) as monitored on the CRT to 12.2 (+0.3, -0) vdc. See Table II). Execute.

6.3.10.2.5 Enter in C-156±XX.X001124 (Enter a value for XX.X which will adjust the +4V power supply (GG 1030) as monitored on the CRT, to 3.5 (+0.15, -0) vdc. See Table II). Execute.

6.3.10.2.6 On K-148, enter the following:

VERB 36 ENTR (Do not restart Computer Activity Program).

6.3.10.2.7 Verify K-START tape F07L003-K105XX-00 LM Self-Check Test is on the K-START tape reader.

6.3.10.2.7.1 Start tape reader.

6.3.10.2.7.2 When tape reader stops, verify:

R1 = +07292
R2 = +105xx
R3 = -00000

6.3.10.2.8 Load E-Memory Program.

6.3.10.2.8.1 Start tape reader.

6.3.10.2.8.2 When tape reader stops, verify:

R1 = 00101.

6.3.10.2.9 Initiate Self-Check.

6.3.10.2.9.1 Start tape reader.

6.3.10.2.9.2 Wait until R2 = 00002. Verify RESTART lamp on DSKY is not lit.

6.3.10.2.10 Into R-154, insert 0011. Verify and execute.

6.3.10.2.11 In the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lighted.

6.3.10.2.12 On the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to ON. Into R-154, insert 1111. Verify and execute. Press ERROR RESET.

6.3.10.2.13 Enter in C-156 (±) XX.X001114 (Enter a value for XX.X which will adjust the +14V power supply (GG 1020) as monitored on the CRT, to 16.4 (+0, -0.4) vdc. See Table II.) Execute.

6.3.10.2.14 Initiate Self-Check.

6.3.10.2.14.1 Return K-START tape to its previous stop.

6.3.10.2.14.2 Start tape reader.

6.3.10.2.14.2 Start tape reader.

6.3.10.2.14.3 Wait until R2 = 00002. Verify RESTART lamp on DSKY is not lit.

6.3.10.2.15 Into R-154, insert 1100. Verify and execute.

6.3.10.2.16 On the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lighted. Set the INHIBIT VOLTAGE FAIL switch to ON. Into R-154, insert 1111. Verify and execute. Press ERROR RESET.

6.3.10.2.17 Enter in C-156±XX.X001124 (Enter a value for XX.X which will adjust the +4V power supply (GG 1030) as monitored on the CRT, to 4.6 (+0, -0.2) vdc. See Table II.) Execute.

6.3.10.2.18 Initiate Self-Check.

6.3.10.2.18.1 Return K-START tape to its previous stop.

6.3.10.2.18.2 Start tape reader.

6.3.10.2.18.3 Wait until R2 = 00002. Verify RESTART lamp on DSKY is not lit.

6.3.10.2.19 Into R-154, insert 0011. Verify and execute.

6.3.10.2.20 On the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lit. Set the INHIBIT VOLTAGE FAIL switch to ON. Into R-154, insert 1111. Verify and execute. Press ERROR RESET.

6.3.10.2.21 Enter in C-156 (±) XX.X001114 (Enter a value for XX.X which will adjust the 14V power supply (GG 1020) as monitored on the CRT, to 12.2 (+0.3, -0) vdc. See Table II). Execute.

6.3.10.2.22 Initiate Self-Check.

6.3.10.2.22.1 Return K-START tape to its previous stop.

6.3.10.2.22.2 Start tape reader.

6.3.10.2.22.3 Wait until R2 = 00002. Verify RESTART lamp on the DSKY is not lit.

6.3.10.2.23 Into R-154, insert 1100. Verify and execute.

6.3.10.2.24 On the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lighted.

6.3.10.2.25 On R-154, enter 0000. Execute.

6.3.10.2.26 On R-155, enter 0000. Execute.

6.3.10.2.27 On K-148, press ERROR RESET.

6.3.10.2.28 On K-148, enter the following:

```
VERB 25 NOUN 26 ENTR
01000           ENTR
01770           ENTR
00007           ENTR
VERB 30         ENTR
```

Addition 11: The following procedure replaces Paragraph 6.3.11 when DANCE [illegible] ropes are installed in the S/C.

6.3.11 <u>LGC Clock Frequency Test</u>

6.3.11.1 Insure that LGC Operate power has been applied for a minimum of 10 minutes.

6.3.11.2 Verify that the counter is connected to the 3.2 kc signal on the hardline.

6.3.11.3 Obtain a 30 second sample of clock frequency.

6.3.11.4 Repeat 6.3.11.3 nine times.

6.3.11.5 The average of the 10 previous readings shall be 30.000000±0.000060 seconds.

6.3.11.6 Insure that the System is not in IMU Operate.

6.3.11.7 Enter the following on K-148:

```
VERB 37         ENTR
06              ENTR
VERB 50 NOUN 25 shall flash
Row 1 = 00062
```

Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the Standby lamp is lighted.

6.3.11.8 Repeat Steps 6.3.11.3 and 6.3.11.4.

6.3.11.9 Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the Standby lamp is not lighted. Restart light may be on. VERB 37 shall flash on the DSKY. Enter VERB 36 ENTR on DSKY. Wait 10 seconds.

6.3.11.10 MARK X Pushbutton Test.

6.3.11.10.1 On the Computer Control and Reticle Dimmer assembly, press and hold MARK X pushbutton.

6.3.11.10.2 On K-148 enter the following:

VERB 06 NOUN 09 ENTR

On the DSKY observe:

Row 1 = 00112
Prog Alarm lamp is lighted.

Press ERR RSET.

6.3.11.10.3 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.10.4 Observe that DSKY Row 1 displays 00004.

6.3.11.10.5 Release MARK X pushbutton.

6.3.11.10.6 Observe that DSKY Row 1 displays 00000.

6.3.11.11 MARK Y Pushbutton Test.

6.3.11.11.1 Press and hold the MARK Y Pushbutton on the Computer Control and Reticle Dimmer Assembly.

6.3.11.11.2 On K-148 enter the following:

VERB 06 NOUN 09 ENTR

On the DSKY observe:

Row 1 = 00112
Prog Alarm lamp is lighted.

Press ERR RSET.

6.3.11.11.3 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.11.4 Observe that DSKY Row 1 displays 00010.

6.3.11.11.5 Release the MARK Y pushbutton.

6.3.11.11.6 Observe that DSKY Row 1 displays 00000.

6.3.11.12 REJECT Pushbutton Test

6.3.11.12.1 Press and hold the REJECT pushbutton on the Computer Control and Reticle Dimmer assembly.

6.3.11.12.2 On K-148, enter the following:

VERB 05 NOUN 09 ENTR

On DSKY observe:

Row 1 = 00112
Prog Alarm lamp is lighted

Press ERR RSET.

6.3.11.12.3 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.12.4 Observe that DSKY Row 1 displays 00020.

6.3.11.12.5 Release the REJECT pushbutton.

6.3.11.12.6 Observe that DSKY Row 1 displays 00000.

6.3.11.13 RETICLE BRIGHTNESS Control Test

6.3.11.13.1 On the DSKY perform the following operation:

VERB 36 ENTR

6.3.11.13.2 On panel 11 close PGNS AOT lamp circuit breaker. On the Computer Control and Reticle Dimmer assembly, rotate the RETICLE BRIGHTNESS control to its minimum light intensity position. View through the AOT and verify that the Reticle lamp is off.

6.3.11.13.3 While viewing through the AOT, slowly rotate the RETICLE BRIGHTNESS control to increase the reticle brightness until a stop is reached. Observe that the reticle brightness has increased in intensity. Return RETICLE BRIGHTNESS control to off state. On panel 11 open PGNS AOT lamp circuit breaker.

6.3.11.14 AOT Eyepiece Heater Test.

6.3.11.14.1 Secure milliameter HP 428B and current probe HP 428A-21A.

6.3.11.14.2 Locate P1 at Computer Control and Reticle Dimmer assembly. Push lacing cord away from P1 back to fifth tie point.

6.3.11.14.3 Clip current probe HP 428A-21A to blue wire in cable with red arrow pointing away from P1. Measure and record current indication. The current shall be between 139 and 244 ma.

6.3.11.14.4 Remove current probe, push lacing cord back to P1 and spot tie.

Addition 12: The following procedure replaces Paragraph 6.3.12 when DANCE ropes are installed in the S/C.

6.3.12 Gimbal Friction Test.

6.3.12.1 Inner Gimbal Friction Test.

6.3.12.1.1 On K-148 enter the following sequence:

```
VERB 41 NOUN 20 ENTR
+00000          ENTR
+00000          ENTR
+00000          ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000          ENTR
+17000          ENTR
+17000          ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000          ENTR
+27000          ENTR
+27000          ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000          ENTR
+00000          ENTR
+00000          ENTR
```

6.3.12.1.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00200).

6.3.12.1.3 Set up Analog Recorder to monitor the following signals:

Meas. No.	Signal Name
a. GG 2110	IG Torque Motor Current
b. GG 2106	IG Servo Error Total
c. GG 2107	IG Servo Error In Phase
d. GG 2112	IG 1X Resolver Sine
e. GG 2113	IG 1X Resolver Cosine
f. GG 2220	IG CDU Fine Error
g. GG 1201	IMU 28V 1% 800 CPS
h. GG 2221	IG CDU Coarse Error

6.3.12.1.4 Set up Analog Recorder to monitor the following signals:

Meas. No.	Signal Name
a. GG 2300	PIPA TEMP
b. GG 2301	IRIG TEMP
c. GG 1520	+28 VDC LGC OPR BUS

6.3.12.1.5 After 10 seconds has elapsed since Step 6.3.12.1.1, enter the following into K-148.

VERB 21 NOUN 01 ENTR	
02737	ENTR (OGC)
00000	ENTR

6.3.12.1.6 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.1.7 On K-148 enter the following sequence:

NOUN 15	ENTR
00000	ENTR ENTR
37777	ENTR ENTR
37743	ENTR ENTR
00000	ENTR ENTR
00000	ENTR (once)

6.3.12.1.8 IG -360° TORQUE

6.3.12.1.9 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.1.10 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.1.11 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTER Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.1.12 On the CRT, verify CDU X, CDU Y, CDU Z all indicate +00000 (±00200).

6.3.12.1.13 After 10 seconds has elapsed since Step 6.3.12.1.11, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.1.14 Verify on CRT, DSKY display.

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.1.15 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
40000 ENTR ENTR
40034 ENTR ENTR
00000 ENTR ENTR
00000 ENTR (once)
40034 ENTR ENTR
Verify R1 = 40034
00000 ENTR ENTR
Verify R1 = 00000
00000 ENTR (once)
Verify R1 = 00000

6.3.12.1.16 IG +360° TORQUE

6.3.12.1.17 On K-148 enter the following sequence

```
VERB 42      ENTR
VERB 33      ENTR
```

6.3.12.1.18 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.2 Outer Gimbal Friction Test

6.3.12.2.1 On K-148 enter the following sequence:

```
VERB 40 NOUN 20 ENTR Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000          ENTR
+00000          ENTR
+00000          ENTR
```

6.3.12.2.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00200).

6.3.12.2.3 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2167	OG Servo Error In Phase
b. GG 2170	OG Torque Motor Current
c. GG 2166	OG Servo Error Total
d. GG 2280	OG CDU Fine Error
e. GG 2172	OG 1X Resolver Sine
f. GG 2173	OG 1X Resolver Cosine
g. GG 2281	OG CDU Coarse Error

6.3.12.2.4 After 10 seconds has elapsed since Step 6.3.12.2.1, enter the following sequence into K-148:

```
VERB 21 NOUN 01 ENTR
02737           ENTR
37777           ENTR
```

6.3.12.2.5 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 = 37777
R3 = 02737.

6.3.12.2.6 On K-148, enter the following sequence:

NOUN 15	ENTR
37743	ENTR ENTR
00000	ENTR ENTR
00000	ENTR ENTR
00000	ENTR ENTR
00000	ENTR (once)

6.3.12.2.7 OG -360° TORQUE

6.3.12.2.8 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.2.9 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.2.10 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTER Wait 10 seconds
VERB 41 NOUN 20 ENTR

+00000	ENTR
+00000	ENTR
+00000	ENTR

6.3.12.2.11 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00200).

6.3.12.2.12 After 10 seconds has elapsed since Step 6.3.12.2.10, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR

02737	ENTR
40000	ENTR

6.3.12.2.13 Verify on CRT, DSKY display:

VERB 21 NOUN 01
R1 = 40000
R3 = 02737

6.3.12.2.14 On K-148 enter the following sequence:

NOUN 15 ENTR
40034 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR

6.3.12.2.15 OG +360° TORQUE

6.3.12.2.16 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.2.17 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.3 Middle Gimbal Friction Test.

6.3.12.3.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+06750 ENTR

6.3.12.3.2 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00200, and CDU Z = +06750±00200.

6.3.12.3.3 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2136	MG Servo Error Total
b. GG 2137	MG Servo Error In Phase
c. GG 2140	MG Torque Motor Current
d. GG 2143	MG 1X Resolver Cosine
e. GG 2250	MG CDU Fine Error
f. GG 2142	MG 1X Resolver Sine
g. GG 2251	MG CDU Coarse Error

6.3.12.3.4 After 10 seconds have elapsed since Step 6.3.12.3.1, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.3.5 Verify on CRT, DSKY display:

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.3.6 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
14000 ENTR ENTR
00000 ENTR (once)

6.3.12.3.7 MG -135° TORQUE

6.3.12.3.8 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 35 ENTR

6.3.12.3.9 Monitor analog recorder. When MG Torque Motor Current (GG 2140) drops to a quiescent level (approximately 6 minutes), stop the recorders.

6.3.12.3.10 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
-06750 ENTR

6.3.12.3.11 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00200, and CDU Z = -06750±00200.

6.3.12.3.12 After 10 seconds has elapsed since Step 6.3.12.3.10, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.3.13 On the CRT, verify DSKY display:

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.3.14 On K-148 enter the following sequence:

NOUN 15	ENTR
00000	ENTR ENTR
00000	ENTR ENTR
00000	ENTR ENTR
63777	ENTR ENTR
77777	ENTR (once)

6.3.12.3.15 MG +135° TORQUE

6.3.12.3.16 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.3.17 Monitor analog recorder. When the MG Torque Motor Current signal (GG 2140) drops to a quiescent level (approximately 6 minutes) stop the recorders.

6.3.12.3.18 On K-148 enter the following sequence:

VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR
Wait 15 seconds	
VERB 36	ENTR

6.3.12.4 Test Analysis.

6.3.12.4.1 Remove the strip charts from analog recorders.

6.3.12.4.2 Examine each trace carefully to detect any sharp discontinuities of the traces. Disregard all transients less than 0.5 second (5 mm) on any Torque Motor Current signal.

6.3.12.4.3 Each Torque Motor Current signal on (GG 2140, GG 2170, GG 2110) shall not exceed (0.125) amp. Sensitivity on recorder is 20 ma/division for GG 2110, GG 2140, and 36 ma/division for GG 2170.

6.3.12.4.4 Each CDU Fine Error (GG 2220, GG 2280, GG 2250) shall not exceed 0.070 volts steady state. Disregard transients.

6.3.12.4.5 Each CDU Coarse Error (GG 2221, GG 2281, GG 2251) shall not exceed 0.680 volts.

Addition 13: Replace Paragraph 6.3.15 with the following when DANCE ropes are installed in the S/C.

6.3.15 AOT Functional Accuracy Test

NOTE: Use of a Dioptometer is required when sighting through AOT. The included angles between target LOS shall be known to ±10 arc-seconds. The elevation of each target LOS shall be known to ±15 arc-seconds.

6.3.15.1 Place the AOT in F detent position.

6.3.15.2 While viewing through the AOT instruct target F operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target F until the center of the target reticle appears in the center of the AOT reticle.

6.3.15.3 Level the Theodolite base while assuring that the center of the target reticle remains in the center of the AOT reticle.

6.3.15.4 When it has been assured that the Theodolite is level and the target reticle appears in the center of the AOT reticle, zero the F Theodolite azimuth dial.

6.3.15.5 Place the AOT in the L detent position.

6.3.15.6 While viewing through AOT instruct the target L operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target L until the target reticle appears in the lower right quadrant of the AOT field of view.

6.3.15.7 Level the Theodolite base while assuring that the target reticle remains visible in the lower right quadrant of the AOT field of view.

6.3.15.8 When it has been assured that the Theodolite is level and the target reticle is visible, zero the L Theodolite azimuth dial.

6.3.15.9 Place the AOT in the R detent position.

6.3.15.10 While viewing through the AOT instruct the R operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target R until the target reticle appears in the lower left quadrant of the AOT field of view.

6.3.15.11 Level the Theodolite base while assuring that the target reticle remains visible in the lower left quadrant of the AOT field of view.

6.3.15.12 When it has been assured that the Theodolite is level and the target reticle is visible, zero the R Theodolite azimuth dial.

6.3.15.13 Verify that target Theodolite L, F and R bases are level. Place the AOT in each detent position from left to right and verify that each target reticle is still visible and in the proper field of view. If adjustments are required insure that the azimuth dial is rezeroed. Repeat this target scanning process until the AOT operator is satisfied with target placement.

6.3.15.14 AOT Measurement of X_1 (L-F)

6.3.15.15 Set AOT in L detent position.

6.3.15.16 Rotate the AOT control knob clockwise until the center of the target reticle is superimposed between the double Y reticle. Read and record as LY = XXX.XX.

6.3.15.17 Rotate the AOT control knob until the center of the target reticle is superimposed between the double SPIRAL lines of AOT reticle. Record AOT dial indication as LS = XXX.XX.

6.3.15.18 Record target L Theodolite elevation angle from horizontal as ϕ1.

6.3.15.19 Set AOT in F detent position.

6.3.15.20 Rotate AOT control knob clockwise until the center of the target reticle is superimposed between the double Y reticle. Record AOT dial indication as FY = XXX.XX.

6.3.15.21 Rotate the AOT control knob until the center of the target reticle is superimposed between the double S reticle lines. Record AOT dial indication as FS = XXX.XX.

6.3.15.22 Record target F Theodolite elevation angle from horizontal as ϕ_2.

6.3.15.23 AOT Measurement of X_2 (L - R).

6.3.15.24 Set AOT in R detent position.

6.3.15.25 Rotate AOT control knob clockwise until the center of the target reticle is superimposed between the double Y reticle. Record AOT dial indication as RY = XXX.XX.

6.3.15.26 Rotate AOT control knob until the center of the target reticle is superimposed between the double SPIRAL reticle lines. Record AOT dial indication as RS = XXX.XX.

6.3.15.27 Record target R Theodolite elevation angle from horizontal ϕ_3.

6.3.15.28 Theodolite measurement of X_1' and X_2'.

6.3.15.28.1 Collimate Theodolite L and F. Read azimuth angle indicated by L Theodolite. Subtract angle from 360.00 deg and record as $\sphericalangle_1$. Read and record the azimuth angle indicated by F Theodolite as $\sphericalangle_2$.

6.3.15.28.2 Collimate Theodolite L and R. Read azimuth angle indicated by R Theodolite and record as $\sphericalangle'_3$. Read and record the azimuth angle indicated by L Theodolite. Subtract angle from 360.00 deg and record as $\sphericalangle'_1$.

6.3.15.28.3 Calculate the values of the included angles between target L and F as X'_1 and targets L and R as X'_2.

$$X'_1 = \cos^{-1}\left\{\sin \phi_1 \sin \phi_2 + \cos \phi_1 \cos \phi_2 \cos\left[180 - (\sphericalangle_1 + \sphericalangle_2)\right]\right\}$$

$$X'_2 = \cos^{-1}\left\{\sin \phi_1 \sin \phi_3 + \cos \phi_1 \cos \phi_3 \cos\left[180 - (\sphericalangle_3 + \sphericalangle'_1)\right]\right\}$$

6.3.15.29 Perform the following calculations:

$$\sigma_L = \frac{360° + \theta_L - \phi_L}{12}$$

$$\sigma_F = \frac{360° + \theta_F - \phi_F}{12}$$

$$\sigma_R = \frac{360° + \theta_R - \phi_R}{12}$$

where:

θ_L = LS and ϕ_L = LY

θ_F = FS and ϕ_F = FY

θ_R = RS and ϕ_R = RY

6.3.15.30 Obtain the AOT Detent Calibration Data and record as follows:

E_L = L Elevation Calibration Data
E_F = F Elevation Calibration Data
E_R = R Elevation Calibration Data

D_L = L Azimuth Calibration Data
D_F = F Azimuth Calibration Data
D_R = R Azimuth Calibration Data

6.3.15.31 Perform the following calculations to determine the Left detent target vector in the Nav Base Coordinate System:

$$\begin{bmatrix} S_{XL} \\ S_{YL} \\ S_{ZL} \end{bmatrix}_{NB} = \begin{bmatrix} \cos E_L \sin \sigma_L \cos (\phi_L - D_L) + \sin E_L \cos \sigma_L \\ -\sin E_L \sin \sigma_L \sin D_L \cos (\phi_L - D_L) + \sin \sigma_L \cos D_L \sin (\phi_L - D_L) + \cos E_L \cos \sigma_L \sin D_L \\ -\sin E_L \sin \sigma_L \cos D_L \cos (\phi_L - D_L) - \sin \sigma_L \sin D_L \sin (\phi_L - D_L) + \cos E_L \cos \sigma_L \cos D_L \end{bmatrix}$$

6.3.15.32 Perform the following calculations to determine the Forward detent target vector in the Nav Base Coordinate System:

$$\begin{bmatrix} S_{XF} \\ S_{YF} \\ S_{ZF} \end{bmatrix}_{NB} = \begin{bmatrix} \cos E_F \sin \sigma_F \cos (\phi_F - D_F) + \sin E_F \cos \sigma_F \\ -\sin E_F \sin \sigma_F \sin D_F \cos (\phi_F - D_F) + \sin \sigma_F \cos D_F \sin (\phi_F - D_F) + \cos E_F \cos \sigma_F \sin D_F \\ -\sin E_F \sin \sigma_F \cos D_F \cos (\phi_F - D_F) - \sin \sigma_F \sin D_F \sin (\phi_F - D_F) + \cos E_F \cos \sigma_F \cos D_F \end{bmatrix}$$

6.3.15.33 Perform the following calculations to determine the Right Detent target vector in the Nav Base Coordinate System:

$$\begin{bmatrix} S_{XR} \\ S_{YR} \\ S_{ZR} \end{bmatrix}_{NB} = \begin{bmatrix} \cos E_R \sin \sigma_R \cos (\phi_R - D_R) + \sin E_R \cos \sigma_R \\ -\sin E_R \sin \sigma_R \sin D_R \cos (\phi_R - D_R) + \sin \sigma_R \cos D_R \sin (\phi_R - D_R) + \cos E_R \cos \sigma_R \sin D_R \\ -\sin E_R \sin \sigma_R \cos D_R \cos (\phi_R - D_R) - \sin \sigma_R \sin D_R \sin (\phi_R - D_R) + \cos E_R \cos \sigma_R \cos D_R \end{bmatrix}$$

6.3.15.34 Calculate AOT measurement of X_1' as follows:

$$X_1' = \cos^{-1} \frac{S_{XL} S_{XF} + S_{YL} S_{YF} + S_{ZL} S_{ZF}}{\sqrt{S_{XL}^2 + S_{YL}^2 + S_{ZL}^2} \times \sqrt{S_{XF}^2 + S_{YF}^2 + S_{ZF}^2}}$$

Verify $X_1 = X_1' \pm 0.08$ degrees.

6.3.15.35 Calculate AOT measurement of X_2' as follows:

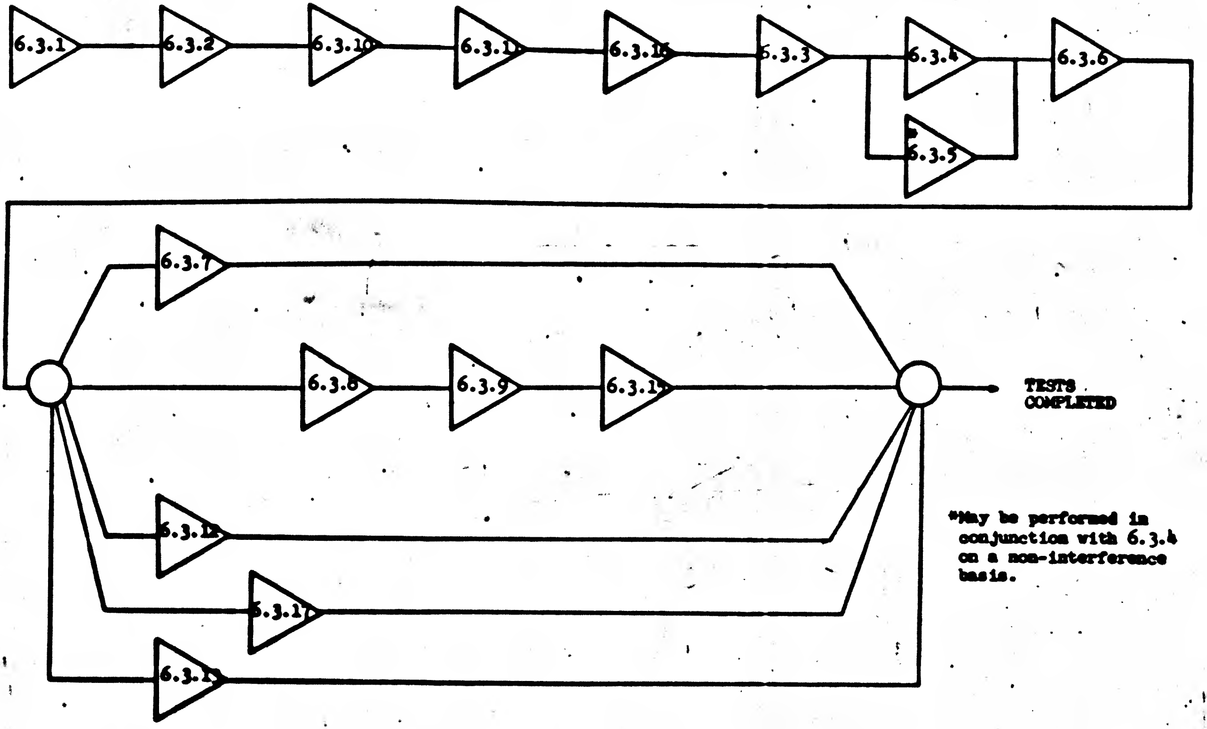
$$X_2' = \cos^{-1} \frac{S_{XL} S_{XR} + S_{YL} S_{YR} + S_{ZL} S_{ZR}}{\sqrt{S_{XL}^2 + S_{YL}^2 + S_{ZL}^2} \times \sqrt{S_{XR}^2 + S_{YR}^2 + S_{ZR}^2}}$$

Verify $X_2 = X_2' \pm 0.08$ degrees.

TABLE I RETEST SEQUENCE

ragraph mber	Test Title	LGC	IMU	PSA	CDU	PTA	DSKY	A HARNESS	B HARNESS	Computer Control & Reticle Dimmer	Nav Base	Alignment Optical Telescope	Signal Conditioner
.1	Standby Power On Test	X	X	X			X	X	X		X		
.2	Alarms and Interrupts Test	X					X	X					
.3	IMU Operate Power on Test		X	X	X	X		X	X		X		X
.4	Temperature Control Verification		X	X				X	X		X		X
.5	PGNCS Power Supply Test			X	X	X		X	X		X		X
.6	IMU Operational Test	X	X	X	X	X		X	X		X		
.7	PGNCS Operational Test		X	X	X			X	X		X		X
.8	IRIG Scale Factor Test		X	X		X		X	X		X		
.9	IMU Performance Test		X	X		X		X	X		X		
.10	LGC Voltage Margin Test	X						X					
.11	LGC Clock Frequency Test	X						X		X			
.12	Gimbal Friction Test		X	X				X	X		X		X
.13	Stabilization Loop Response Test		X	X		X		X	X		X		
.15	AOT Functional Performance Test											X	
.16	Flight Rope Fixed Memory Bank Sum Check	X						X					
.17	LGC Clock Alignment Test	X						X					
.1	Emergency Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*
.2	Normal Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*
.3	Initial Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*
.4	General Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*

To be used as necessary to turn system on or off.



*May be performed in conjunction with 6.3.4 on a non-interference basis.

TEST PROCEDURE FLOWGRAM
FIGURE 2

ADDENDUM IV

LM 4 and Subsequent Spacecraft Measurement Deletions.

Addition 1: Paragraph 6.3.1.3.4, delete last sentence.

Addition 2: Delete Paragraph 6.3.4.2.

Addition 3: Replace Paragraph 6.3.4.3 with the following:

6.3.4.3 When 1 hour has elapsed from the time of IMU OPERATE Power turn-on, monitor PIPA TEMP (GG 2300). Monitor and record temperature readings every 5 minutes for 30 minutes. Verify that each reading does not deviate from the average value by more than 0.1 deg. F.

Addition 4: Delete Paragraph 6.3.4.6.

Addition 5: Delete Paragraph 6.3.7.24.

Addition 6: Delete Paragraph 6.3.12.1.4.b.

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Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approval
3/31/67	A	33482	2, 3, 5-75; was 75 pages, now 83 pages.	MGM EA
5/30/67	B	34079	1, 2, 6-18, 20-83; Was 83 pages now 86 pages.	EA
8/24/67	C	34437	12	EA
10/12/67	D	34840	3, 5-86; was 86 pages, now 128 pages.	EA
1/22/68	E	35471	2,3,5,6,8-10, 12-15, 17-22, 24, 26-28, 30-35,	EA
			41, 42, 44, 46-128; was 128 pages, now 132	
			pages.	
5/13/68	F	36212	1,2, 8-132; was 132 pages, now 155 pages.	EA WLS
6/17/68	G	36354	79, 88-90, 92, 93, 95, 96, 98-105, 108-155.	EA WLS
			Was 155 pages, now 166 pages.	

This specification consists of page 1 to 166 inclusive.

ROVALS	NOT AFFECTED CCA 477-C274 NASA/MSC				AC

APPENDIX I

MEASUREMENT TOLERANCES

SIGNAL	SIGNAL NAME	G&N LAB TEST REQUIREMENT	PSAAM AND/OR SCA UNCERTAINTY % OF FULL SCALE
OG 1020 link 4*	+14 vdc LOC Supply	14.0±0.6 vdc	0%
OG 1030 link 4	+4 vdc LOC Supply	4.0±0.2 vdc	0%
OG 1040 link 5**	+120 vdc PIPA Supply	120±6.0 vdc	1%
OG 1070 link 4	+4 vdc CDU Supply	4.0±0.2 vdc	0%
OG 1100 link 4	-28 vdc Supply	-27.5±6.0 vdc	0%
OG 1110 link 5	2.5 vdc Telemetry Bias No. 1	2.5±0.1 vdc	0%
OG 1201 link 5	IMU 28V 800 cps 1%	28±0.56V rms	1%
OG 1202 link 4	IMU 28V 800 cps 5%	28±1.4V rms	1.5%
OG 1203 link 4	IMU 28V 800 cps 5%	28±2.1V rms	1.5%
OG 1331 link 5	3.2 kc 28V Supply 1%	28.6±0.56V rms	1%
OG 1500 link 4	+28 vdc IMU Oper BUS	28.0-3.5, +5.5 vdc	0%
OG 1510 link 4	+28 vdc IMU STBY BUS	28.0 -3.5, +5.5 vdc	0%
OG 1513X link 5	+28 vdc IMU STBY/OFF	28.0±1 vdc	0%
OG 1520 link 4	+28 vdc LOC Oper BUS	28.0±4.6 vdc	0%
OG 1523X link 5	+28 vdc LOC Operate	28.0±1 vdc	0%
OG 2001 link 5	X PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
OG 2021 link 5	Y PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
OG 2041 link 5	Z PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
OG 2106 link 4	IG Servo Error Total	0.0±60 MV rms at null	1%
OG 2107 link 5	IG Servo Error IN PH	0.0±60 MV rms at null	2%
OG 2110 link 4	IG Torque Motor Current	0.125 AMP Max during any fine Align Torque	0%
OG 2110 link 5	IG Torque Motor Current	0.125 AMP Max during any fine Align Torque	1%
OG 2112 link 5	IG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
OG 2113 link 5	IG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
OG 2121 link 5	IG 1X Resolver Out-Sine 11°	5.35±0.27V rms at 11°	2%
OG 2136 link 4	MG Servo Error Total	0.0±60 MV rms at null	1%
OG 2137 link 5	MG Servo Error IN PH	0.0±60 MV rms at null	2%
OG 2140 link 4	MG Torque Motor Current	0.125 AMP Max during any fine Align Torque	0%
OG 2140 link 5	MG Torque Motor Current	0.125 AMP Max during any fine Align Torque	1%
OG 2142 link 5	MG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
OG 2143 link 5	MG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
OG 2151 link 5	MG 1X Resolver Out-Sine 11°	5.35±0.27V rms at 11°	2%
OG 2166 link 4	OG Servo Error Total	0.0±60 MV rms at null	1%
OG 2167 link 5	OG Servo Error IN PH	0.0±60 MV rms at null	2%
OG 2170 link 4	OG Torque Motor Current	0.125 AMP Max during. fine Align Torque	0%
OG 2170 link 5	OG Torque Motor Current	0.125 AMP Max during any fine Align Torque	1%
OG 2172 link 5	OG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
OG 2173 link 5	OG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
OG 2181 link 5	OG 1X Resolver Out-Sine 11°	5.35±0.27V rms at 11°	2%
OG 2219 link 5	Pitch Attitude Error	5.05±0.5V rms at 17°	1%
OG 2220 link 4	IG CDU Fine Error	0.0±0.07V rms at null	1%
OG 2221 link 4	IG CDU Coarse Error	0.0±0.68V rms at null	1%

Addition 3: Replace Paragraph 6.2.2.4.1 with the following when DANCE ropes are installed in the S/C.

6.2.2.4.1 On K-148, enter the following:

VERB 21 NOUN 01 ENTR
00034 ENTR
00000 ENTR
Verify GIMBAL LOCK light and PGNS CAUTION light OFF
VERB 21 NOUN 01 ENTR
01037 ENTR
40000 ENTR
Verify NO ATT OFF

Addition 4: The following procedure replaces Paragraph 6.2.4 when DANCE ropes are installed in the S/C.

6.2.4 General Turn-On Procedure.

6.2.4.1 This step shall be effective only after having completed the initial turn-on procedures.

6.2.4.2 Proper coolant flow shall be verified.

6.2.4.3 Depress +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11 to supply IMU STANDBY power. Record time.

6.2.4.4 Depress +28 VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11 to supply LGC OPERATE power. The Restart lamp may come on; if it does, press RSET on the DSKY.

6.2.4.5 On K-148, enter the following:

VERB 36 ENTR

6.2.4.6 Verify K-START tape F07L003-K10538-00 LM Self Check Test is on the K-START tape reader.

6.2.4.7 Start tape reader.

6.2.4.8 When tape reader stops, verify:

R1 = +07292
R2 = +10538 tape number
R3 = -00000 tape Rev. No.

6.2.4.9 Start tape reader.

6.2.4.10 When tape reader stops, verify:

R1 = 00101

6.2.4.11 Start tape reader

6.2.4.12 Monitor DSKY until R3 (SCOUNT+1) increments twice. If an error is detected, the PROG CAUTION lamp on the DSKY shall light.

6.2.4.13 On K-148, enter the following to turn off Self-Check:

VERB 21 NOUN 27 ENTR
00000 ENTR
VERB 34 ENTR

6.2.4.14 CAUTION: LGC OPERATE and IMU STANDBY power must have been applied a minimum of two hours before energizing the IMU OPERATE circuit breaker in Step 6.2.4.19, unless all of the following conditions are met:

IF:
1. The G&N System has previously been in Standby Mode at least two hours and subsequently been in Operate Mode, AND
2. The gimbals are placed in a parked position prior to shutdown, AND
3. The shutdown period did not exceed 5 days, AND
4. The Spacecraft or IMU have not been moved in any way during the shutdown period.

THEN: The two-hour Standby Mode operation requirement is reduced to 15 minutes.

6.2.4.15 The G&N System is defined as being in Standby Mode when LGC OPERATE and IMU STANDBY power is applied and IMU OPERATE power is off. The inertial components shall have suspension power in Standby Mode.

6.2.4.16 The G&N System is defined as being in Operate Mode when LGC OPERATE, IMU STANDBY and IMU OPERATE power is applied to the system.

6.3.1.5 **LGC Operational Tests**

6.3.1.5.1 LGC Self-Check.

6.3.1.5.1.1 On K-148, enter the following:

VERB 36 ENTR (Do not restart Computer Activity Program) Wait 10 seconds.

6.3.1.5.1.2 Verify K-START tape F07L003-K10538-00 LM Self-Check Test is on the K-START tape reader.

6.3.1.5.1.3 Start tape reader.

6.3.1.5.1.4 When tape reader stops, verify:

R1 = +07292
R2 = +10538 (tape number)
R3 = -00000 (tape revision)

6.3.1.5.1.5 Load E-Memory Program.

6.3.1.5.1.5.1 Start tape reader.

6.3.1.5.1.5.2 When tape reader stops, verify R1 displays +00101.

6.3.1.5.1.6 Initiate Self-Check

6.3.1.5.1.6.1 Start Tape reader.

6.3.1.5.1.6.2 When R3 = 00002, start tape reader.

6.3.1.5.1.6.3 When tape reader stops, wait 30 seconds.

6.3.1.5.2 DSKY Check.

6.3.1.5.2.1 Start tape reader.

6.3.1.5.2.2 All the electroluminescent elements (PROG, VERB, NOUN, and Row 1, Row 2, Row 3) shall display the decimal number nine (9). Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's

6.3.1.5.6.1 On K-148, enter the following:

VERB 37 ENTR
06 ENTR

Observe VERB 50 NOUN 25 flashing.
R1 = 00062 (switch LGC power down)

6.3.1.5.6.2 On DSKY, depress PRO pushbutton for approximately 3 seconds.

6.3.1.5.6.3 Verify STBY status indicator lamp is ON.

6.3.1.5.6.4 On the CRT, verify the 3.2 KC 28V Supply (CG 1331) is between 28.04 and 29.16V RMS.

6.3.1.5.6.5 On DSKY, depress PRO pushbutton for approximately 3 seconds to return to LGC Operate Mode.

6.3.1.5.6.6 Verify STBY status indicator lamp is OFF. RESTART light may be ON. Verify LGC WARNING is OFF and PGNCS CAUTION is ON. VERB 37 will flash.

6.3.1.5.6.7 On DSKY enter the following:

VERB 36 ENTR

6.3.1.5.7 Standby/Proceed Check.

6.3.1.5.7.1 On the DSKY, press and hold the PRO pushbutton, Verify CHAN 32 on CRT displays 57777.

Addition 6: The following procedure replaces Paragraph 6.3.6 when DANCE ropes are installed in the S/C.

NOTE: Manual DSKY entries during this test may result in a test abort.

6.3.6 IMU Operational Test

6.3.6.1 Verify K-START tape F07L003-K10531-00 LM G/N OPCHK is on K-START tape reader.

6.3.6.1.1 Start tape reader.

6.3.6.1.2 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +07292
b. R2 = +10631
c. R3 = -00000

6.3.6.2 E-Memory Program Load and Sum Check.

6.3.6.2.1 Start tape reader.

6.3.6.2.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00101.

6.3.6.3 Local g Measurement.

6.3.6.3.1 Start tape reader.

6.3.6.3.2 In approximately 10 minutes, VERB 06 NOUN 98 shall flash.

6.3.6.3.3 From the CRT DSKY display read and record Row 1 and Row 2 (local gravity whole and fractional, respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.3.6.4 Horizontal Earth Rate Measurement

6.3.6.4.1 Press PRO pushbutton on DSKY.

6.3.6.4.2 In approximately 2 seconds VERB 06 NOUN 98 shall flash. From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.3.6.5 Enter the following on K-148:

VERB 34	ENTR
VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR

Addition 7: The following procedure replaces Paragraph 6.3.7 when DANCE ropes are installed in the S/C.

6.3.7 Semi-Automatic Mode Test

6.3.7.1 Verify K-START Tape F07L003-K10530-00 LM Semi-Automatic Mode Test is on K-START tape reader.

6.3.7.1.1 Start tape reader.

6.3.7.1.2 When tape reader stops verify the following on CRT DSKY

a. R1 = +07292
b. R2 = +10530
c. R3 = -00000

6.3.7.19.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST, PROG CAUTION lamp shall go out.

6.3.7.20 IG CDU Coarse Fail Test

6.3.7.20.1 Start tape reader.

6.3.7.20.2 When tape reader stops verify CRT DSKY Row 1 indicates 02501.

6.3.7.20.3 Start tape reader.

6.3.7.20.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp PROG alarm light on DSKY is lit. Verify FAILREG on CRT displays 03777.

6.3.7.20.5 Start tape reader.

6.3.7.20.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST, PROG CAUTION lamp shall go out.

6.3.7.21 MG CDU Coarse Fail Test

6.3.7.21.1 Start tape reader.

6.3.7.21.2 When tape reader stops verify CRT DSKY Row 1 indicates 02601.

6.3.7.21.3 Start tape reader.

6.3.7.21.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp PROG alarm light on DSKY is lit. Verify FAILREG on CRT displays 03777.

6.3.7.21.5 Start tape reader.

6.3.7.21.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST, PROG CAUTION lamp shall go out.

6.3.7.22 FDAI Linearity Test.

6.3.7.22.1 Start tape reader.

6.3.7.22.2 When tape reader stops verify that CRT DSKY Row 1 indicates 02701. Wait 5 seconds.

6.3.7.22.3 Start tape reader.

6.3.7.23.6 On analog recorder, verify the 1X Resolver Sine signals (GG 2112, GG 2172, GG 2142) null out to less than 0.5 VRMS. Release IMU CAGE switch to the OFF position. Disregard any momentary transients on the 1X Resolver Sine signals when the switch is released. Any sustained oscillations shall be cause for immediate removal of IMU Operate Power.

6.3.7.23.7 On the CRT, verify all IMU gimbal angles indicate between 357 and 003.

6.3.7.24 Stop analog recorder.

6.3.7.24.1 On K-148 enter the following:

VERB 36	ENTR	wait 10 seconds
VERB 43	ENTR	
+01700	ENTR	
+00600	ENTR	
-01700	ENTR	

On CRT, verify the following:

YAW ATT ERROR is between +15.3 and +18.7 DEG (GG 2249)
PITCH ATT ERROR is between +05.5 and +06.6 DEG (GG 2219)
ROLL ATT ERROR is between -15.3 and -18.7 DEG (GG 2279)

6.3.7.25 On K-148 enter the following sequence:

VERB 36	ENTR	wait 10 seconds
VERB 41 NOUN 20	ENTR	
+00800	ENTR	
+00100	ENTR	
-00800	ENTR	

6.3.7.26 On CRT verify the following:

IG 1X Resolver Sin (11°) is between +06.5 and +09.6 DEG (GG 2121)
MG 1X Resolver Sin (11°) is between +00.5 and +02.5 DEG (GG 2151)
OG 1X Resolver Sin (11°) is between -06.5 and -09.5 DEG (GG 2181)

6.3.7.27 On K-148 enter the following:

VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR

Addition 8: The following procedure replaces paragraph 6.3.8 when DANCE flight ropes are installed in the S/C.

6.3.8 IRIG Scale Factor Test

6.3.8.1 Verify K-START Tape F07L003-K00063-XX IRIG Scale Factor Test is on the K-START tape reader. XX equals tape revision number.

6.3.8.2 Start tape reader.

6.3.8.2.1 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +07292
b. R2 = +00063
c. R3 = -000XX XX is tape revision number

6.3.8.2.2 Start tape reader.

6.3.8.2.3 When tape reader stops, wait 20 seconds.

6.3.8.3 E-Memory Program Load.

6.3.8.3.1 Start tape reader.

6.3.8.3.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00000.

6.3.8.4 Test Position Data Load (+X Scale Factor)

6.3.8.4.1 Start tape reader.

6.3.8.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.3.8.4.3 Start tape reader.

6.3.8.4.4 When tape reader stops, VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude (See Table 1)

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.4.5 On K-148 enter the following:

VERB 23 ENTR

6.3.8.8.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude (See Table 1)

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.8.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.8.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.3.8.9 Test Position Data Load (-Z Scale Factor)

6.3.8.9.1 Start tape reader.

6.3.8.9.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.3.8.9.3 Start tape reader.

6.3.8.9.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude (See Table 1)

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.9.5 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.3.8.10 Test Position Data Load (+X Scale Factor)

6.3.8.10.1 Start tape reader.

6.3.8.10.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.3.8.10.3 Start tape reader.

6.3.8.14 **Test Position Data Load (-Y Scale Factor)**

6.3.8.14.1 Start tape reader.

6.3.8.14.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.3.8.14.3 Start tape reader.

6.3.8.14.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude (See Table 1)

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.14.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.14.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.3.8.15 **Test Position Data Load (-Z Scale Factor)**

6.3.8.15.1 Start tape reader.

6.3.8.15.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.3.8.15.3 Start tape reader.

6.3.8.15.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude (See Table 1)

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.15.5 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.3.8.21.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude (See Table 1)

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.21.5 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.3.8.22 Test Position Data Load (+X Scale Factor)

6.3.8.22.1 Start tape reader.

6.3.8.22.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00001.

6.3.8.22.3 Start tape reader.

6.3.8.22.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude (See Table 1)

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.22.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.22.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.3.8.23 Test Position Data Load (+Y Scale Factor)

6.3.8.23.1 Start tape reader.

6.3.8.23.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.3.8.23.3 Start tape reader.

6.3.6.27 Test Position Data Load (-Z Scale Factor)

6.3.6.27.1 Start tape reader.

6.3.6.27.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.3.6.27.3 Start tape reader.

6.3.6.27.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.6.27.5 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.3.6.28 Terminate this test by entering the following into K-148:

VERB 36		ENTR	Wait 10 seconds.
VERB 41	NOUN 20	ENTR	
+00000		ENTR	
+00000		ENTR	
+00000		ENTR	

6.3.6.29 The four-run average Scale Factor Error for each of the six positions shall be 0 plus or minus 1750 ppm.

Addition 9: The following procedure replaces Paragraph 6.3.9 when DANCE flight ropes are installed in the S/C.

6.3.9 IMU Performance Test. A reference data sheet is provided at the end of this section to aid in data reduction.

6.3.9.1 Insure that IMU Operate power and LGC Operate power has been supplied for a minimum of one hour and that the IMU is not in a Gimbal Lock condition.

6.3.9.2 On CRT, monitor and record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.3.9.3 Verify K-START Tape F07L003-K00081-XX IMU Performance test is on the tape reader. XX equals tape revision number.

6.3.9.4 Start tape reader.

6.3.9.4.1 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +07202
b. R2 = +00001
c. R3 = -000XX (where XX equals tape revision number.)

6.3.9.4.2 Start tape reader.

6.3.9.4.3 When tape reader stops, wait 10 seconds.

6.3.9.5 Start the tape reader. After 15 seconds, verify IMU is coarse aligned to zero degrees.

6.3.9.6 E-Memory Program Load

6.3.9.6.1 Start the tape reader. When tape reader stops, verify the following DSKY display:

Row 1	13745
Row 3	2575

6.3.9.7 Test Position +00001.

6.3.9.7.1 E-Memory Program and Test Position Matrix Sum Check

6.3.9.7.1.1 Start tape reader.

6.3.9.7.1.2 When tape reader stops, verify DSKY Row 1 displays +00001.

6.3.9.7.2 Start tape reader.

6.3.9.7.2.1 When tape reader stops wait 20 seconds.

6.3.9.7.3 Test Initialization.

6.3.9.7.3.1 Start tape reader.

6.3.9.7.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode 07

Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.21 On K-148, enter the following sequence:

```
VERB 41 NOUN 20 ENTR
+00000          ENTR
+00000          ENTR
+00000          ENTR
```

6.3.9.22 Calculations.

NOTE: Use Post Vibration or System Test data points only.

6.3.9.22.1 Y PIPA Data Correction Calculation.

6.3.9.22.1.1 From the uplink file tape, the compressed data tape or the PCM tape, request a data reduction of the X and Z accelerometer ΔV counts (addresses 37 and 41, respectively) and the TIME 2 and TIME 1 registers (addresses 24 and 25, respectively) for the period during which the Y PIPA test was being performed in Positions 5 and 6 of the IMU Performance test.

6.3.9.22.1.2 Perform the following calculations for Position 5.

$G'_5 = (G_5/\text{Cos } \theta y_5)$

where:

G_5 = Measured acceleration term (line k)

G'_5 = Corrected acceleration term

$\text{Cos } \theta y_5 = 1 - (\theta^2 y_5/2)$ for small angles

$$\theta y_5 = \sqrt{\theta^2{}_{x5} + \theta^2{}_{z5}}$$

and:

$\theta_{z5} = (\Delta V_{x5} - \Delta V_x \text{ Bias}) (\text{S. F.}_x)/(\Delta T) \text{ (local g)}$

$\theta_{x5} = (\Delta V_{z5} - \Delta V_z \text{ Bias}) (\text{S. F.}_z)/(\Delta T) \text{ (local g)}$

and:

$V_x \text{ Bias} = (\text{X PIPA Bias}) (\Delta T) / \text{S. F.}_x$

$V_z \text{ Bias} = (\text{Z PIPA Bias}) (\Delta T) / \text{S. F.}_z$

S. F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.3.9.22.1.3 Perform the following calculations for Position 6.

$G'_6 = (G_6 / \text{Cos } \theta y_6)$

where:

G_6 = Measured acceleration term (line ℓ)

G'_6 = Corrected acceleration term

$\text{Cos } \theta y_6 = 1 - (\theta^2 y_6 / 2)$ for small angles

$$\theta y_6 = \sqrt{\theta^2_{x6} + \theta^2_{z6}}$$

and:

$\theta_{z6} = (\Delta V_{x6} - \Delta V_x \text{ Bias}) (\text{S.F.}_x) / (\Delta T) (\text{local g})$

$\theta_{x6} = (\Delta V_{z6} - \Delta V_z \text{ Bias}) (\text{S.F.}_z) / (\Delta T) (\text{local g})$

and:

$V_x \text{ Bias} = (\text{X PIPA Bias}) (\Delta T) / \text{S.F.}_x$

$V_z \text{ Bias} = (\text{Z PIPA Bias}) (\Delta T) / \text{S.F.}_z$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.3.9.22.2 Obtain data from last IRIG and/or PIPA Test and fill in Data Sheet x_{i-1}.

6.3.9.22.3 Obtain data from second last IRIG and/or PIPA Test and fill in Data Sheet x_{i-2}.

6.3.9.22.4 Obtain data from third last IRIG and/or PIPA Test and fill in Data Sheet x_{i-3}.

6.3.9.22.5 Perform the following calculations for each item appearing on Data Sheet x_i and transfer all results to lines au through bi.

NOTE: See Paragraph 5.6 before continuing.

$$D_1 = \left| x_{i-1} - x_i \right|$$

$$D_2 = \left| x_{i-1} - x_i \right| + \left| x_{i-2} - x_{i-1} \right|$$

$$D_3 = \left| x_{i-3} - x_{i-2} \right| + \left| x_{i-2} - x_{i-1} \right| + \left| x_{i-1} - x_i \right|$$

DATA SHEET

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.3.9. 7.4.3	+N BDY - ADOAY Transfer result to line af.	meru/g	( )___ . __	a
6.3.9. 8.4.3	+N BDZ - ADOAZ Position +00002 Transfer result to line ag.	meru/g	( )___ . __	b
6.3.9. 8.5.2	-X PIPA Test Position +00002	cm/sec^2	( ) 0 0 ___ . ( ) _____	c
6.3.9. 8.6.2	-N BDX + ADIAX Position +00002	meru/g	( ) ___ . __	d
6.3.9. 9.4.3	+N BDX - ADOAX Position +00003 Multiply by -1 and transfer to line ah.	meru/g	( ) ___ . __	e
6.3.9. 10.4.3	+N BDY + ADSRAY Position +00004	meru/g	( ) ___ . __	f
6.3.9. 10.5.2	-Z PIPA Test Position +00004	cm/sec^2	( ) 0 0 ___ . ( ) _____	g
6.3.9 10.6.2	+N BDZ + ADIAZ Position +00004	meru/g	( ) ___ . __	h

DATA SHEET (Cont)

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.3.9 11.4.3	+Y PIPA Test Position +00005	cm/sec^2	( )00___. ( )_____	i
6.3.9 12.4.3	-Y PIPA Test Position +00006	cm/sec^2	( )00___. ( )_____	j
6.3.9 13.4.3	-NBDX + .707 (ADSRAX - ADOAX) Position +00007	meru/g	( )___.__	k
6.3.9 14.4.3	-.707 (NBDZ + NBDY) +0.5 (ADIAZ - ADIAY) +0.5 (ADSRAY + ADSRAZ) Position +00008	meru/g	( )___.__	l
6.3.9 15.4.3	-NBDZ + .707 (ADSRAZ- +ADOAZ) Position +00009	meru/g	( )___.__	m
6.3.9 16.4.3	.707 (NBDY - NBDX) +0.5 (ADIAY - ADIAX) +0.5 (ADSRAX)+0.5 (ADOAY) Position +00010	meru/g	( )___.__	n
6.3.9 17.4.3	-NBDX - ADOAX Position +00011	meru/g	( )___.__	o
6.3.9. 17.5.2	+X PIPA Test Position +00011	cm/sec^2	( )00___. ( )_____	p
6.3.9. 18.4.3	+NBDY + ADOAY Position +00012	meru/g	( )___.__	q
6.3.9. 18.5.2	+Z PIPA Test Position +00012	cm/sec^2	( )00___. ( )_____	r
6.3.9. 19.4.3	+NBDZ + ADOAZ Position +00013	meru/g	( )___.__	s

DATA SHEET

CALCULATION	PARAMETER	UNITS	
$\frac{\text{line a} + \text{line q}}{2}$ = ( )___.__ $\frac{NBDY - ADOAY + NBDY + ADOAY}{2}$ Transfer result to line ao	NBDY	meru	t
$\frac{\text{line q} - \text{line a}}{2}$ = ( )___.__ $\frac{NBDY + ADOAY - (NBDY - ADOAY)}{2}$	ADOAY	meru/g	u
$\frac{\text{line b} + \text{line s}}{2}$ = ( )___.__ $\frac{NBDZ - ADOAZ + NBDZ + ADOAZ}{2}$ Transfer result to line ap	NBDZ	meru	v
$\frac{\text{line s} - \text{line b}}{2}$ = ( )___.__ $\frac{NBDZ + ADOAZ - (NBDZ - ADOAZ)}{2}$	ADOAZ	meru/g	w
$\frac{\text{line e} - \text{line o}}{2}$ = ( )___.__ $\frac{NBDX - ADOAX - (-NBDX - ADOAX)}{2}$ Transfer result to line aq	NBDX	meru	x
$\frac{\text{line e} + \text{line o}}{2}$ x -1 = ( )___.__ $\frac{NBDX - ADOAX - NBDX - ADOAX}{2}$ x -1	ADOAX	meru/g	y

DATA SHEET (Cont)

CALCULATION	PARAMETER	UNITS	
line d + line x = ( ) ___ . __ (-NBDX + ADIAX) + NBDX Transfer result to line au	ADIAX	meru/g	z
line f - line t = ( ) ___ . __ (+NBDY + ADSRAY) - NBDY Transfer result to line ar	ADSRAY	meru/g	aa
line h - line v = ( ) ___ . __ (+NBDZ + ADSRAZ) - NBDZ Transfer result to line av	ADIAZ	meru/g	ab
[line k + line x + .707 line z] x 1.414 [-NBDX + .707 ADSRAX - .707 ADOAX + NBDX + .708 ADOAX] x 1.414 Transfer results to line at	ADSRAX	meru/g	ac
(line m + line v + line w) x 1.414 [-NBDZ + .707 (ADSRAZ-ADOAZ) + NBDZ + .707 ADOAZ] x 1.414 Transfer results to line as	ADSRAZ	meru/g	ad
(line n - .707 line t + .707 line x + 0.5 line s - 0.5 line ac - 0.5 line u) x 2 [.707(NBDY - NBDX) + 0.5 (ADIAY-ADIAX) +0.5 ADSRAX + 0.5 ADOAY -.707 NBDY + .707 NBDX + 0.5 ADIAX -0.5 ADSRAX - 0.5 ADOAY] x 2 Transfer results to line aw.	ADIAY	meru/g	ae
line p - line c = ( )	PIPA X2G	cm/sec^2	af
line i - line j = ( )	PIPA Y2G	cm/sec^2	ag
line r - line g = ( )	PIPA Z2G	cm/sec^2	ah

DATA SHEET (Cont)

CALCULATION	PARAMETER	UNITS	
1958.48 — line af x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ax.	X PIPA S. F.	cm/sec/ pulse	ai
1958.48 — line ag x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ay.	Y PIPA S. F.	cm/sec/ pulse	aj
1958.48 — line ah x 1 cm/sec/pulse = Subtract 1.00000 from this value, multiply x 10^6 and transfer results to line az.	Z PIPA S. F.	cm/sec/ pulse	ak
1/2 (line p + line o) = ( )__ . ___ Transfer results to line ba.	X PIPA Bias	cm/sec^2	al
1/2 (line i + line j) = ( )__ . ___ Transfer results to line bb.	Y PIPA Bias	cm/sec^2	am
1/2 (line r + line g) = ( )__ . ___ Transfer results to line bc.	Z PIPA Bias	cm/sec^2	an

DATA SHEET

PARAMETER	UNITS	D_1	MAX	D_2	MAX	D_3	MAX
NBDY	meru		6		9		11
NBDZ	meru		6		9		11
NBDX	meru		6		9		11
ADSRAY	meru/g		14		21		25
ADSRAZ	meru/g		14		21		25
ADSRAX	meru/g		14		21		25
ADIAX	meru/g		17		33		40
ADIAZ	meru/g		17		33		40
ADIAY	meru/g		17		33		40
X PIPA S.F. error	PPM		400		500		600
Y PIPA S.F. error	PPM		400		500		600
Z PIPA S.F. error	PPM		400		500		600
X PIPA Bias	cm/sec^2		0.5		0.7		0.9
Y PIPA Bias	cm/sec^2		0.5		0.7		0.9
Z PIPA Bias	cm/sec^2		0.5		0.7		0.9

Addition 10: The following procedure replaces Paragraph 6.3.10 when DANCE ropes are installed in the S/C.

6.3.10 LGC Voltage Margin Test

6.3.10.1 Initial Conditions.

6.3.10.1.1 Insure that the G&N System is in the Standby Mode.

6.3.10.1.2 On the CRT, verify the +28 VDC LGC OPERATE bus is between 24.5 and 33.5 vdc (GG 1520).

6.3.10.1.3 On Panel 5, set lighting override ANUN SW to OFF. Rotate the ANUN/NUM dimmer fully CCW.

6.3.10.2 Voltage Margin Determination

6.3.10.2.1 On the PSA Adapter Module (PSAAM) (410-31080), place INHIBIT VOLTAGE FAIL switch to ON.

CAUTION: The +4 vdc LGC supply voltage shall never be operated lower than +2.5 vdc or higher than +5.2 vdc (GG 1030.)

The +14 vdc LGC supply shall never be operated less than +8.5 vdc or higher than +17.0 vdc (GG 1020). LTG-ANUN/NUM control on Panel 5 shall be set to DIM during the performance of the Voltage Margin Test in order to avoid decreasing the operating life of the DSKY EL lamps.

NOTE: The flashing indication of the LGC supplies may be disregarded for this test. The charts in Table II may be used to determine approximate values for "XX.X" values of C-156 voltage dial settings corresponding to various power supply voltages.

6.3.10.2.2 Enter 0001 into R-155. Verify and execute.

6.3.10.2.3 Enter 1111 into R-154. Verify and execute.

6.3.10.2.4 Enter in C-156±XX.X001114. (Enter a value for XX.X which will adjust the +14V power supply (GG 1020) as monitored on the CRT to 12.2 (+0.3, -0) vdc. See Table II). Execute.

6.3.10.2.5 Enter in C-156±XX.X001124 (Enter a value for XX.X which will adjust the +4V power supply (GG 1030) as monitored on the CRT, to 3.5 (+0.15, -0) vdc. See Table II). Execute.

6.3.10.2.6 On K-148, enter the following:

VERB 36 ENTR (Do not restart Computer Activity Program). Wait 10 seconds.

6.3.10.2.7 Verify K-START tape F07L003-K10638-00 LM Self-Check Test is on the K-START tape reader.

6.3.10.2.7.1 Start tape reader.

6.3.10.2.7.2 When tape reader stops, verify:

R1 = +07292
R2 = +10638
R3 = -00000

6.3.10.2.8 Load E-Memory Program.

6.3.10.2.8.1 Start tape reader.

6.3.10.2.8.2 When tape reader stops, verify:

R1 = 00101.

6.3.10.2.9 Initiate Self-Check.

6.3.10.2.9.1 Start tape reader.

6.3.10.2.9.2 Wait until R3 = 00002. Verify RESTART lamp on DSKY is not lit.

6.3.10.2.10 Into R-154, insert 0011. Verify and execute.

6.3.10.2.11 In the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lighted.

6.3.10.2.12 On the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to ON. Into R-154, insert 1111. Verify and execute. Press ERROR RESET.

6.3.10.2.13 Enter in C-156 (±) XX.X001114 (Enter a value for XX.X which will adjust the +14V power supply (GG 1020) as monitored on the CRT, to 16.4 (+0, -0.4) vdc. See Table II.) Execute.

6.3.10.2.14 Initiate Self-Check.

6.3.10.2.14.1 Return K-START tape to its previous stop.

6.3.10.2.14.2 Start tape reader.

6.3.10.2.14.3 Wait until R3 = 00002. Verify RESTART lamp on DSKY is not lit.

6.3.10.2.15 Into R-154, insert 1100. Verify and execute.

6.3.10.2.16 On the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lighted. Set the INHIBIT VOLTAGE FAIL switch to ON. Into R-154, insert 1111. Verify and execute. Press ERROR RESET.

6.3.10.2.17 Enter in C-156±XX.X001124 (Enter a value for XX.X which will adjust the +4V power supply (GG 1030) as monitored on the CRT, to 4.6 (+0, -0.2) vdc. See Table II.) Execute.

6.3.10.2.18 Initiate Self-Check.

6.3.10.2.18.1 Return K-START tape to its previous stop.

6.3.10.2.18.2 Start tape reader.

6.3.10.2.18.3 Wait until R3 = 00002. Verify RESTART lamp on DSKY is not lit.

6.3.10.2.19 Into R-154, insert 0011. Verify and execute.

6.3.10.2.20 On the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lit. Set the INHIBIT VOLTAGE FAIL switch to ON. Into R-154, insert 1111. Verify and execute. Press ERROR RESET.

6.3.10.2.21 Enter in C-156 (±) XX.X001114 (Enter a value for XX.X which will adjust the 14V power supply (GG 1020) as monitored on the CRT, to 12.2 (+0.3, -0) vdc. See Table II). Execute.

6.3.10.2.22 Initiate Self-Check.

6.3.10.2.22.1 Return K-START tape to its previous stop.

6.3.10.2.22.2 Start tape reader.

6.3.10.2.22.3 Wait until R3 = 00002. Verify RESTART lamp on the DSKY is not lit.

6.3.10.2.23 Into R-154, insert 1100. Verify and execute.

6.3.10.2.24 On the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lighted.

6.3.12.1.8 IG -360° TORQUE

6.3.12.1.9 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.1.10 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.1.11 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTER Wait 10 seconds

VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR

6.3.12.1.12 On the CRT, verify CDU X, CDU Y, CDU Z all indicate +00000 (+00180).

6.3.12.1.13 After 10 seconds has elapsed since Step 6.3.12.1.11, enter the following sequence into K-148:

VERB 21 NOUN 01	ENTR
02737	ENTR
00000	ENTR

6.3.12.1.14 Verify on CRT, DSKY display.

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.1.15 On K-148 enter the following sequence:

NOUN 15	ENTR
00000	ENTR ENTR
40000	ENTR ENTR
40034	ENTR ENTR
00000	ENTR ENTR
00000	ENTR (once)
40034	ENTR ENTR
Verify R1 = 40034	
00000	ENTR ENTR
Verify R1 = 00000	
00000	ENTR (once)
Verify R1 = 00000	

6.3.12.1.16 IG +360° TORQUE

6.3.12.1.17 On K-148 enter the following sequence

VERB 42 ENTR
VERB 33 ENTR

6.3.12.1.18 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.2 Outer Gimbal Friction Test

6.3.12.2.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.2.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00100).

6.3.12.2.3 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2167	OG Servo Error In Phase
b. GG 2170	OG Torque Motor Current
c. GG 2166	OG Servo Error Total
d. GG 2280	OG CDU Fine Error
e. GG 2172	OG 1X Resolver Sine
f. GG 2173	OG 1X Resolver Cosine
g. GG 2281	OG CDU Coarse Error

6.3.12.2.4 After 10 seconds has elapsed since Step 6.3.12.2.1, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
37777 ENTR

6.3.12.2.5 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 = 37777
R3 = 02737

6.3.12.2.6 On K-148, enter the following sequence:

NOUN 15	ENTR
37743	ENTR ENTR
00000	ENTR ENTR
00000	ENTR ENTR
00000	ENTR ENTR
00000	ENTR (once)

6.3.12.2.7 OG -360° TORQUE

6.3.12.2.8 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.2.9 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.2.10 On K-148 enter the following sequence:

VERB 40 NOUN 20	ENTER Wait 10 seconds
VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR

6.3.12.2.11 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00150).

6.3.12.2.12 After 10 seconds has elapsed since Step 6.3.12.2.10, enter the following sequence into K-148:

VERB 21 NOUN 01	ENTR
02737	ENTR
40000	ENTR

6.3.12.2.13 Verify on CRT, DSKY display:

VERB 21 NOUN 01
R1 = 40000
R3 = 02737

6.3.12.2.14 On K-148 enter the following sequence:

NOUN 15 ENTR
40034 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR

6.3.12.2.15 OG +360° TORQUE

6.3.12.2.16 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.2.17 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.3 Middle Gimbal Friction Test.

6.3.12.3.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+06750 ENTR

6.3.12.3.2 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00150, and CDU Z = +06750±00200.

6.3.12.3.3 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2136	MG Servo Error Total
b. GG 2137	MG Servo Error In Phase
c. GG 2140	MG Torque Motor Current
d. GG 2143	MG 1X Resolver Cosine
e. GG 2250	MG CDU Fine Error
f. GG 2142	MG 1X Resolver Sine
g. GG 2251	MG CDU Coarse Error

6.3.12.3.4 After 10 seconds have elapsed since Step 6.3.12.3.1, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.3.5 Verify on CRT, DSKY display:

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.3.6 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
14000 ENTR ENTR
00000 ENTR (once)

6.3.12.3.7 MG -135° TORQUE

6.3.12.3.8 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.3.9 Monitor analog recorder. When MG Torque Motor Current (GG 2140) drops to a quiescent level (approximately 6 minutes), stop the recorders.

6.3.12.3.10 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
-06750 ENTR

6.3.12.3.11 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00150, and CDU Z = -06750±00200.

6.3.12.3.12 After 10 seconds has elapsed since Step 6.3.12.3.10, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.3.13 On the CRT, verify DSKY display:

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.3.14 On K-148 enter the following sequence:

NOUN 15	ENTR
00000	ENTR ENTR
00000	ENTR ENTR
00000	ENTR ENTR
63777	ENTR ENTR
77777	ENTR (once)

6.3.12.3.15 MG +135° TORQUE

6.3.12.3.16 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.3.17 Monitor analog recorder. When the MG Torque Motor Current signal (GG 2140) drops to a quiescent level (approximately 6 minutes) stop the recorders.

6.3.12.3.18 On K-148 enter the following sequence:

VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR
Wait 15 seconds	
VERB 36	ENTR

6.3.12.4 Test Analysis.

6.3.12.4.1 Remove the strip charts from analog recorders.

6.3.12.4.2 Examine each trace carefully to detect any sharp discontinuities of the traces. Disregard all transients less than 0.5 second (5 mm) on any Torque Motor Current signal.

6.3.12.4.3 Each Torque Motor Current signal on (GG 2140, GG 2170, GG 2110) shall not exceed (0.125) amp. Sensitivity on recorder is 20 ma/division for GG 2110, GG 2140, and 36 ma/division for GG 2170.

6.3.12.4.4 Each CDU Fine Error (GG 2220, GG 2280, GG 2250) shall not exceed 0.070 volts steady state. Disregard transients.

6.3.12.4.5 Each CDU Coarse Error (GG 2221, GG 2281, GG 2251) shall not exceed 0.680 volts.

Addition 13: Replace Paragraph 6.3.15 with the following when DANCE ropes are installed in the S/C.

6.3.15 AOT Functional Accuracy Test

NOTE: Use of a Dioptometer is required when sighting through AOT. The included angles between target LOS shall be known to ±10 arc-seconds. The elevation of each target LOS shall be known to ±15 arc-seconds.

6.3.15.1 Place the AOT in F detent position.

6.3.15.2 While viewing through the AOT instruct target F operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target F until the center of the target reticle appears in the center of the AOT reticle.

6.3.15.3 Level the Theodolite base while assuring that the center of the target reticle remains in the center of the AOT reticle.

6.3.15.4 When it has been assured that the Theodolite is level and the target reticle appears in the center of the AOT reticle, zero the F Theodolite azimuth dial.

6.3.15.5 Place the AOT in the L detent position.

6.3.15.6 While viewing through AOT instruct the target L operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target L until the target reticle appears in the lower right quadrant of the AOT field of view.

6.3.15.7 Level the Theodolite base while assuring that the target reticle remains visible in the lower right quadrant of the AOT field of view.

6.3.15.8 When it has been assured that the Theodolite is level and the target reticle is visible, zero the L Theodolite azimuth dial.

6.3.15.9 Place the AOT in the R detent position.

6.3.15.10 While viewing through the AOT instruct the R operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target R until the target reticle appears in the lower left quadrant of the AOT field of view.

6.3.15.11 Level the Theodolite base while assuring that the target reticle remains visible in the lower left quadrant of the AOT field of view.

6.3.15.12 When it has been assured that the Theodolite is level and the target reticle is visible, zero the R Theodolite azimuth dial.

6.3.15.13 Verify that target Theodolite L, F and R bases are level. Place the AOT in each detent position from left to right and verify that each target reticle is still visible and in the proper field of view. If adjustments are required insure that the azimuth dial is rezeroed. Repeat this target scanning process until the AOT operator is satisfied with target placement.

6.3.15.14 AOT Measurement of X_1 (L-F)

6.3.15.15 Set AOT in L detent position.

6.3.15.16 Rotate the AOT control knob clockwise until the center of the target reticle is superimposed between the double Y reticle. Read and record as LY = XXX.XX.

6.3.15.17 Rotate the AOT control knob until the center of the target reticle is superimposed between the double SPIRAL lines of AOT reticle. Record AOT dial indication as LS = XXX.XX.

6.3.15.18 Record target L Theodolite elevation angle from horizontal as $\phi 1$.

6.3.15.19 Set AOT in F detent position.

6.3.15.20 Rotate AOT control knob clockwise until the center of the target reticle is superimposed between the double Y reticle. Record AOT dial indication as FY = XXX.XX.

6.3.15.21 Rotate the AOT control knob until the center of the target reticle is superimposed between the double S reticle lines. Record AOT dial indication as FS = XXX.XX.

6.3.15.22 Record target F Theodolite elevation angle from horizontal as ϕ_2.

6.3.15.23 AOT Measurement of X_2 (L - R).

6.3.15.24 Set AOT in R detent position.

6.3.15.25 Rotate AOT control knob clockwise until the center of the target reticle is superimposed between the double Y reticle. Record AOT dial indication as RY = XXX.XX.

6.3.15.26 Rotate AOT control knob until the center of the target reticle is superimposed between the double SPIRAL reticle lines. Record AOT dial indication as RS = XXX.XX.

6.3.15.27 Record target R Theodolite elevation angle from horizontal ϕ_3.

6.3.15.28 Theodolite measurement of X_1' and X_2'.

6.3.15.28.1 Collimate Theodolite L and F. Read azimuth angle indicated by L Theodolite. Subtract angle from 360.00 deg and record as α_1. Read and record the azimuth angle indicated by F Theodolite as α_2.

6.3.15.28.2 Collimate Theodolite L and R. Read azimuth angle indicated by R Theodolite and record as α'_3. Read and record the azimuth angle indicated by L Theodolite. Subtract angle from 360.00 deg and record as α'_1.

6.3.15.28.3 Calculate the values of the included angles between target L and F as X'_1 and targets L and R as X'_2.

$$X'_1 = \cos^{-1}\left\{\sin\phi_1 \sin\phi_2 + \cos\phi_1 \cos\phi_2 \cos\left[180 - (\alpha_1 + \alpha_2)\right]\right\}$$

$$X'_2 = \cos^{-1}\left\{\sin\phi_1 \sin\phi_3 + \cos\phi_1 \cos\phi_3 \cos\left[180 - (\alpha_3 + \alpha'_1)\right]\right\}$$

6.3.15.29 Perform the following calculations:

$$\sigma_L = \frac{360° + \theta_L - \phi_L}{12}$$

$$\sigma_F = \frac{360° + \theta_F - \phi_F}{12}$$

$$\sigma_R = \frac{360° + \theta_R - \phi_R}{12}$$

where:

θ_L = LS and ϕ_L = LY

θ_F = FS and ϕ_F = FY

θ_R = RS and ϕ_R = RY

6.3.15.30 Obtain the AOT Detent Calibration Data and record as follows:

E_L = L Elevation Calibration Data
E_F = F Elevation Calibration Data
E_R = R Elevation Calibration Data

D_L = L Azimuth Calibration Data
D_F = F Azimuth Calibration Data
D_R = R Azimuth Calibration Data

6.3.15.31 **Perform the following calculations to determine the Left detent target vector in the Nav Base Coordinate System:**

$$\begin{bmatrix} S_{XL} \\ S_{YL} \\ S_{ZL} \end{bmatrix}_{NB} = \begin{bmatrix} \cos E_L \sin \sigma_L \cos (\phi_L - D_L) + \sin E_L \cos \sigma_L \\ -\sin E_L \sin \sigma_L \sin D_L \cos (\phi_L - D_L) + \sin \sigma_L \cos D_L \sin (\phi_L - D_L) + \cos E_L \cos \sigma_L \sin D_L \\ -\sin E_L \sin \sigma_L \cos D_L \cos (\phi_L - D_L) - \sin \sigma_L \sin D_L \sin (\phi_L - D_L) + \cos E_L \cos \sigma_L \cos D_L \end{bmatrix}$$

6.3.15.32 **Perform the following calculations to determine the Forward detent target vector in the Nav Base Coordinate System:**

$$\begin{bmatrix} S_{XF} \\ S_{YF} \\ S_{ZF} \end{bmatrix}_{NB} = \begin{bmatrix} \cos E_F \sin \sigma_F \cos (\phi_F - D_F) + \sin E_F \cos \sigma_F \\ -\sin E_F \sin \sigma_F \sin D_F \cos (\phi_F - D_F) + \sin \sigma_F \cos D_F \sin (\phi_F - D_F) + \cos E_F \cos \sigma_F \sin D_F \\ -\sin E_F \sin \sigma_F \cos D_F \cos (\phi_F - D_F) - \sin \sigma_F \sin D_F \sin (\phi_F - D_F) + \cos E_F \cos \sigma_F \cos D_F \end{bmatrix}$$

6.3.15.33 **Perform the following calculations to determine the Right Detent target vector in the Nav Base Coordinate System:**

$$\begin{bmatrix} S_{XR} \\ S_{YR} \\ S_{ZR} \end{bmatrix}_{NB} = \begin{bmatrix} \cos E_R \sin \sigma_R \cos (\phi_R - D_R) + \sin E_R \cos \sigma_R \\ -\sin E_R \sin \sigma_R \sin D_R \cos (\phi_R - D_R) + \sin \sigma_R \cos D_R \sin (\phi_R - D_R) + \cos E_R \cos \sigma_R \sin D_R \\ -\sin E_R \sin \sigma_R \cos D_R \cos (\phi_R - D_R) - \sin \sigma_R \sin D_R \sin (\phi_R - D_R) + \cos E_R \cos \sigma_R \cos D_R \end{bmatrix}$$

6.3.15.34 **Calculate AOT measurement of X_1' as follows:**

$$X_1' = \cos^{-1} \frac{S_{XL} S_{XF} + S_{YL} S_{YF} + S_{ZL} S_{ZF}}{\sqrt{S_{XL}^2 + S_{YL}^2 + S_{ZL}^2} \times \sqrt{S_{XF}^2 + S_{YF}^2 + S_{ZF}^2}}$$

Verify $X_1 = X_1' \pm 0.08$ degrees.

6.3.15.35 **Calculate AOT measurement of X_2' as follows:**

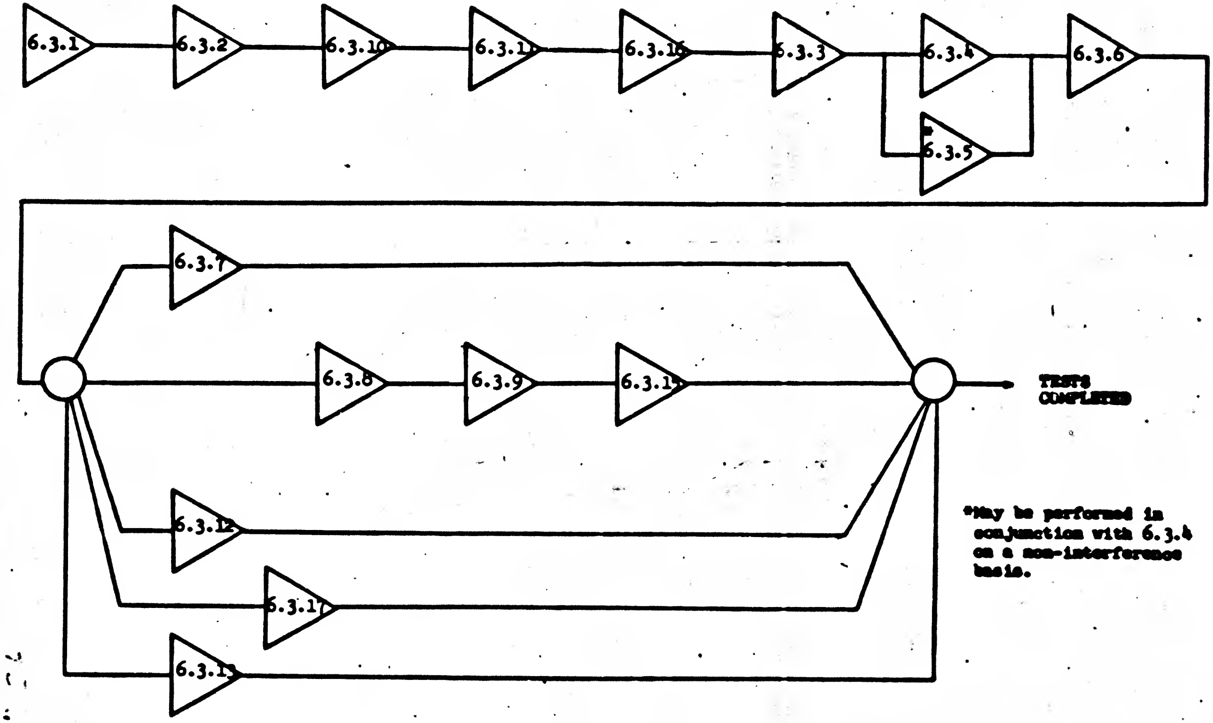
$$X_2' = \cos^{-1} \frac{S_{XL} S_{XR} + S_{YL} S_{YR} + S_{ZL} S_{ZR}}{\sqrt{S_{XL}^2 + S_{YL}^2 + S_{ZL}^2} \times \sqrt{S_{XR}^2 + S_{YR}^2 + S_{ZR}^2}}$$

Verify $X_2 = X_2' \pm 0.08$ degrees.

TABLE I RETEST SEQUENCE

Paragraph Number	Test Title	LGC	IMU	PSA	CDU	PTA	DSKY	A HARNESS	B HARNESS	Computer Control & Reticle Dimmer	Nav Base	Alignment Optical Telescope	Signal Conditioner
6.3.1	Standby Power On Test	X	X	X			X	X	X		X		
6.3.2	Alarms and Interrupts Test	X					X	X					
6.3.3	IMU Operate Power on Test		X	X	X	X		X	X		X		X
6.3.4	Temperature Control Verification		X	X				X	X		X		X
6.3.5	PGNCS Power Supply Test			X	X	X		X	X		X		X
6.3.6	IMU Operational Test	X	X	X	X	X		X	X		X		
6.3.7	PGNCS Operational Test		X	X	X			X	X		X		X
6.3.8	IRIG Scale Factor Test		X	X		X		X	X		X		
6.3.9	IMU Performance Test		X	X		X		X	X		X		
6.3.10	LGC Voltage Margin Test	X						X					
6.3.11	LGC Clock Frequency Test	X						X		X			
6.3.12	Gimbal Friction Test		X	X				X	X		X		X
6.3.13	Stabilization Loop Response Test		X	X		X		X	X		X		
6.3.15	AOT Functional Performance Test											X	
6.3.16	Flight Rope Fixed Memory Bank Sum Check	X						X					
6.3.17	LGC Clock Alignment Test	X						X					
6.2.1	Emergency Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.2	Normal Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.3	Initial Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*
6.2.4	General Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*

* To be used as necessary to turn system on or off.



*May be performed in conjunction with 6.3.4 on a non-interference basis.

TEST PROCEDURE FLOWGRAM
FIGURE 2

ADDENDUM IV

LM 4 and Subsequent Spacecraft Measurement Deletions.

Addition 1:	Paragraph 6.3.1.3.4, delete last sentence.
Addition 2:	Delete Paragraph 6.3.4.2.
Addition 3:	Replace Paragraph 6.3.4.3 with the following:
6.3.4.3	When 1 hour has elapsed from the time of IMU OPERATE Power turn-on, monitor PIPA TEMP (GG 2300). Monitor and record temperature readings every 5 minutes for 30 minutes. Verify that each reading does not deviate from the average value by more than 0.1 deg. F.
Addition 4:	Delete Paragraph 6.3.4.6.
Addition 5:	Delete Paragraph 6.3.7.24.
Addition 6:	Delete Paragraph 6.3.12.1.4.b.

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POST INSTALLATION CHECKOUT
SPECIFICATION FOR LM G&N SYSTEM (KSC)

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approval
3/31/67	A	33482	2, 3, 5-75; was 75 pages, now 83 pages.	MGM EA
6/30/67	B	34079	1, 2, 6-18, 20-83; Was 83 pages now 86 pages.	EA
8/24/67	C	34437	19	EA
10/12/67	D	34840	3, 5-86; was 86 pages, now 128 pages.	EA
1/22/68	E	35471	2, 3, 5, 6, 8-10, 12-15, 17-22, 24, 26-28, 30-35,	EA
			41, 42, 44, 45-128; was 128 pages, now 132	
			pages.	
5/13/68	F	36212	1, 2, 8-132; was 132 pages, now 155 pages.	EA WLS
6/17/68	G	36354	79, 88-90, 92, 93, 95, 96, 98-105, 108-155.	EA WLS
			Was 155 pages, now 166 pages.	
8/7/68	H	36671	12, 19, 20, 27-29, 49, 79, 91-93, 95, 98, 99, 109, 112	EA WLS
			115, 119, 122, 123, 137-143, 154-166. Was 166 pages, now 172 pages. Also pages 45 46, 48 and 52	

This specification consists of page 1 to 172 inclusive.

ROVALS	NOT AFFECTED CCA 497-0274 NASA/MSC				AC

Paragraph No.	Test Title
6.3.1	Standby Power In Test
6.3.2	Alarms and Interrupts Test
6.3.3	IMU Operate Power On Test
6.3.4	Temperature Control Verification
6.3.5	PGNCS Power Supply Test
6.3.6	G&N Operational Test
6.3.7	PGNCS Operational Test
6.3.8	IRIG Scale Factor Test
6.3.9	IMU Performance Test
6.3.10	LGC Voltage Margin Test
6.3.11	LGC Clock Frequency Test
6.3.12	Gimbal Friction Test
6.3.13	Stabilization Loop Response Test
6.3.14	G and N Fine Alignment Test
6.3.15	AOT Functional Performance Test
6.3.16	Flight Rope Fixed Memory Bank Sum Check
6.3.17	LGC Clock Alignment Test

G&N TESTS

FIGURE 1

6. DETAILED REQUIREMENTS

6.1 Initial Test Conditions

6.1.1 The IMU shall be supplied with heater power on a continuous basis. The portable temperature controller (Model No. 410-31058) shall be connected at all times although heater power may be supplied from the +28 VDC IMU STANDBY bus and monitored through ACE.

6.1.2 The IMU shall never be without heater power longer than 15 minutes.

6.2 Operational Requirements

6.3.5.4 The LGC Temperature (GG 4300) shall be between +45 and +130 DEG. F.

6.3.5.5 The +28 VDC IMU OPERATE BUS (GG 1500) shall be between 24.5 and 33.5 VDC.

6.3.5.6 The +28 VDC IMU STANDBY BUS (GG 1510) shall be between 21.5 and 33.5 VDC.

6.3.5.7 The +28 VDC LGC OPERATE BUS (GG 1520) shall be between 24.5 and 33.5 VDC.

6.3.5.8 The +120 VDC PIPA Supply (GG 1040) shall be between 114 and 126 VDC.

6.3.5.9 The -28 VDC Supply (GG 1100) shall be between -21.5 and -33.5 VDC.

6.3.5.10 The +4 VDC CDU Supply (GG 1070) shall be between 3.8 and 4.2 VDC.

6.3.5.11 The IMU 28V/800 CPS 1 pct Supply (GG 1201) shall be between 27.44 and 28.56 VRMS.

6.3.5.12 The IMU 28V 800 CPS 5 pct 90 PH Supply (GG 1202) shall be between 26.6 and 29.4 VRMS.

6.3.5.13 The IMU 28V 800 CPS 5 pct 0 PH Supply (GG 1203) shall be between 25.9 and 30.1 VRMS.

6.3.5.14 The 3.2 KC 28V Supply (GG 1331) shall be between 28.04 and 29.16 VRMS.

6.3.5.15 The 2.5 VDC T/M Bias (GG 1110) shall be between 2.44 and 2.56 VDC.

6.3.5.16 The +14 VDC LGC Supply (GG 1020) shall be between 13.6 and 14.4 VDC.

6.3.5.17 The +4 VDC LGC Supply (GG 1030) shall be between 3.8 and 4.2 VDC.

6.3.5.18 The phase difference between the 3.2 KC supply and LGC sync shall be 0±10° (NG 1336).

6.3.5.19 Record the noise levels of the following signals displayed on the CRT.

Item No.	Measurement No.	Signal	Requirement
a.	NG 1021	14 VDC LGC Noise RMS	<0.2 VRMS
b.	NG 1031	4 VDC LGC Noise RMS	<0.2 VRMS
c.	NG 1071	4 VDC CDU Noise RMS	<0.1 VRMS
d.	NG 1501	28 VDC IMU Operate Noise RMS	<1.0 VRMS
e.	NG 1511	28 VDC IMU Standby Noise RMS	<1.0 VRMS
f.	NG 1521	28 VDC LGC Operate Noise RMS	<2.0 VRMS

6.3.12.3.14 On K-148 enter the following sequence:

NOUN 15	ENTR
00000	ENTR ENTR
00000	ENTR ENTR
00000	ENTR ENTR
63777	ENTR ENTR
77777	ENTR (once)

6.3.12.3.15 MG +135° TORQUE

6.3.12.3.16 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.3.17 Monitor analog recorder. When the MG Torque Motor Current signal (GG 2140) drops to a quiescent level (approximately 6 minutes) stop the recorders.

6.3.12.3.18 On K-148 enter the following sequence:

VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR
Wait 15 seconds	
VERB 36	ENTR

6.3.12.4 Test Analysis.

6.3.12.4.1 Remove the strip charts from analog recorders.

6.3.12.4.2 Examine each trace carefully to detect any sharp discontinuities of the traces. Disregard all transients less than 0.5 second (5 mm) on any Torque Motor Current signal.

6.3.12.4.3 Each Torque Motor Current signal on (GG 2140, GG 2170, GG 2110) shall not exceed (0.125) amp. Sensitivity on recorder is 20 ma/division for GG 2110, GG 2140, and 36 ma/division for GG 2170.

6.3.12.4.4 Each CDU Fine Error (GG 2220, GG 2280, GG 2250) shall not exceed 0.070 volts steady state. Disregard transients.

6.3.12.4.5 Each CDU Coarse Error (GG 2221, GG 2281, GG 2251) shall not exceed 0.680 volts.

Addition 14 Replace Tables 4 and 5 with the following when DANCE ropes are installed in the S/C:

TABLE 4
RETEST MATRIX

O.O.S. PARAMETERS	6.3.9.1 through 6.3.9.6.1	7. all	8. thru 8.4.3	8. through 8.5.2	8. all	9. all	10. thru 10.4.3	10. thru 10.5.2	10. all	11. all	12. all	13. all	14. all	15. all	16. all	17. thru 17.4.3	17. all	18. thru 18.4.3	18. all	19. all
NBDX	X					X										X				
NBDY	X	X																X		
NBDZ	X		X																	X
ADSRAX	X					X						X				X				
ADSRAY	X	X					X											X		
ADSRAZ	X		X											X						X
ADIAX	X	X			X	X										X				
ADIAY	X	X			X	X						X			X	X		X		
ADIAZ	X		X			X			X											X
X PIPA BIAS & S.F. ERROR	X			X															X	
Y PIPA BIAS & S.F. ERROR	X									X	X									
Z PIPA BIAS & S.F. ERROR	X							X									X			
Terminate all retest sequences with VERB 36 ENTR																				

TABLE 5

O.S.S PARAMETER	PERFORM POSITIONS	PARAMETERS TO BE REQUALIFIED
NBDY	1 and 12	NBDY
NBDZ	2 and 13	NBDZ
NBDX	3 and 11	NBDX
ADSRAY	1, 4 & 12	ADSRAY, NBDY
ADSRAZ	2, 9 & 13	ADSRAZ, NBDZ
ADSRAX	3, 7 & 11	ADSRAX, NBDX
ADIAY	1 thru 3, 7, 10, 11 and 12	NBDY, NBDX, ADIAX, ADSRAX, ADIAY
ADIAZ	2 thru 4 and 13	NBDZ, NBDX, ADIAZ
ADIAX	1 thru 3 and 11	NBDX, ADIAX, NBDY
X PIPA Bias or S.F.	2 and 12	X PIPA BIAS, X PIPA S.F.
Y PIPA Bias or S.F.	5 and 6	Y PIPA BIAS, Y PIPA S.F.
Z PIPA Bias or S.F.	4 and 11	Z PIPA BIAS, Z PIPA S.F.

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4/6/67	A	33512	2, 4, 7, 8	MGM EA	-

This specification consists of page 1 to 9 inclusive.

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4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the CDU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the CDU shall be subjected to complete testing in accordance with Section 4 of Specification PS2007222 except that the tests in 4.3.2 and 4.3.24 shall not be performed unless a tray is replaced, or if a module is replaced, the requirements of 4.3.3 shall apply in addition to the requirements of this paragraph.

4.3 MINIMUM RETEST. The CDU shall be subjected to the following applicable test(s) only when Minimum Retest is specified by the ARRO. Figure 1 may be used as a reference to locate the specified modules.

4.3.1 "S" or "X" Trays. If either the "S" or "X" trays were repaired or replaced, all tests specified in Specification PS2007222 shall be performed or retest shall be as specified by the ARRO.

4.3.2 Tray Separation. In the event of tray separation only, all tests for the IMU axes in Specification PS2007222 shall be performed with the exceptions and conditions specified in Table I of this specification.

4.3.3 Module Replacement. Following module replacement, the applicable tests in accordance with Table II shall be performed in addition to the tests specified in 4.3.2, 4.3.3.1, and 4.3.3.2. Five modules may be replaced without CDU thermal testing. Any one CDU axis with two or more modules replaced, any two of which interface, requires that axis to be retested in accordance with paragraph 4.3.24 of Specification PS2007222. Interfacing modules are defined in Table III. If module (Drawing No.'s) 2007236, 2007238 or 2007243 are replaced, paragraph 4.3.24 of PS2007222 shall be rerun for the CDU Axis of replacement.

4.3.3.1 Replaced Module Thermal Testing. Analog modules replaced shall be thermally tested on a module basis prior to installation in the CDU, except modules 2007236, 2007238 or 2007243.

a. The modules shall be placed in a thermally controlled chamber, while energized, at ambient air temperatures of 50° ±5°F and 130° ±5°F for an hour at each temperature.

b. The electrical tests for the modules shall be performed in accordance with Table IV at each temperature specified in a.

4.3.3.2 Replaced Module Vibration Testing. Digital modules replaced shall be subjected to module level vibration prior to installation in the CDU, if the modules have not been subjected to vibration.

a. The modules, while energized, shall be subjected to a vibration sweep from 10 to 2000 cps at a rate of 4 octaves per minute. The magnitude of the vibration shall be 6g rms limited to a 0.4 inch pp constant displacement from 10 cps to the crossover frequency.

TABLE I

TRAY SEPARATION

<table>
<tr><th>TEST PARAGRAPH OF PS2007222</th><th>EXCEPTIONS AND TEST CONDITIONS</th></tr>
<tr><td>4.2.1.1.1</td><td>Not required</td></tr>
<tr><td>4.2.1.3</td><td>3.2.1 and 3.2.2.1 only</td></tr>
<tr><td>4.2.1.5.1</td><td>28±1 vdc DC Supply voltage only applied</td></tr>
<tr><td>4.3.2</td><td>Not required</td></tr>
<tr><td>4.3.4</td><td>Use only the following resolver angles specified in Table III
<table>
<tr><th>1X</th><th>16X</th></tr>
<tr><td>0°</td><td>0°</td></tr>
<tr><td>5.6°</td><td>90°</td></tr>
<tr><td>168.7°</td><td>180°</td></tr>
<tr><td>331.8°</td><td>270°</td></tr>
</table></td></tr>
<tr><td>4.3.15</td><td>Use only the NULL, 2^7, $2^7 . 2^8$ EC&L Counter conditions specified in Table II</td></tr>
<tr><td>4.3.21</td><td>Use only the 1XRS and 16XRS/64XRS resolver inputs in Table XI
<table>
<tr><th>1XRS</th><th>16XRS/64XRS</th></tr>
<tr><td>0°</td><td>0°</td></tr>
<tr><td>5.6°</td><td>90°</td></tr>
<tr><td>11.25°</td><td>180°</td></tr>
<tr><td>16.8°</td><td>270°</td></tr>
<tr><td>22.5°</td><td>360°</td></tr>
<tr><td>90°</td><td>0°</td></tr>
<tr><td>270°</td><td>0°</td></tr>
</table></td></tr>
<tr><td>4.3.22</td><td>Not required</td></tr>
<tr><td>4.3.23</td><td>Not required</td></tr>
<tr><td>4.3.24</td><td>Not required</td></tr>
</table>

TABLE II

TEST SELECTION

REPLACED MODULE	APPLICABLE TEST PARAGRAPH OF PS2007222
2007139 ERROR ANGLE COUNTER & LOGIC	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.15, 4.3.16, 4.3.18, 4.3.20 and 4.3.11
2007140 READ COUNTER	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.16, 4.3.18, and 4.3.21
2007141 ** DIGITAL MODE	4.3.4, 4.3.5, 4.3.6, 4.3.7, 4.3.8, 4.3.16, 4.3.13* and 4.3.18
2007142 ** POWER SUPPLY	4.3.6 and 4.3.4(modified as indicated in Table I of this specification)
2007236 COARSE SYSTEM	4.3.4, 4.3.10, 4.3.11.3, 4.3.11.4,4.3.12,4.3.14.2, 4.3.18, 4.3.19, 4.3.21, 4.3.23, 4.3.17.4 and 4.3.24
2007237 D/A CONVERTER	4.3.13, 4.3.15, 4.3.16, 4.3.17 and 4.3.20
2007238 MSA & QUAD REJECT.	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.17.1, 4.3.21, 4.3.23 and 4.3.24
2007243 QUADRANT SELECT	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.21, 4.3.23 and 4.3.24
2007254** MODE MODULE	4.3.5, 4.3.6, 4.3.8, 4.3.14, 4.3.16, 4.3.20 4.3.13 and 4.3.15
2007263** INTERROGATE	4.3.4, 4.3.13, 4.3.18.1, 4.3.14.3 and 4.3.23

* Amplitude and width only

** To be run on all 5 CDU Axes

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This specification consists of page 1 to 9 inclusive.

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4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the CDU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the CDU shall be subjected to complete testing in accordance with Section 4 of Specification PS2007222 except that the tests in 4.3.2 and 4.3.24 shall not be performed unless a tray is replaced, or if a module is replaced, the requirements of 4.3.3 shall apply in addition to the requirements of this paragraph.

4.3 MINIMUM RETEST. The CDU shall be subjected to the following applicable test(s) only when Minimum Retest is specified by the ARRO. Figure 1 may be used as a reference to locate the specified modules.

4.3.1 "S" or "X" Trays. If either the "S" or "X" trays were repaired or replaced, all tests specified in Specification PS2007222 shall be performed or retest shall be as specified by the ARRO.

4.3.2 Tray Separation. In the event of tray separation only, all tests for the IMU axes in Specification PS2007222 shall be performed with the exceptions and conditions specified in Table I of this specification.

4.3.3 Module Replacement. Following module replacement, the applicable tests in accordance with Table II shall be performed, on the axis of module replacement only, in addition to the tests specified in 4.3.2, 4.3.3.1, and 4.3.3.2. Five modules may be replaced without CDU thermal testing. Any one CDU axis with two or more modules replaced, any two of which interface, requires that axis to be retested in accordance with paragraph 4.3.24 of Specification PS2007222. Interfacing modules are defined in Table III. If module (Drawing No.'s) 2007236, 2007238 or 2007243 are replaced, paragraph 4.3.24 of PS2007222 shall be retun for the CDU Axis of replacement.

4.3.3.1 Replaced Module Thermal Testing. Analog modules replaced shall be thermally tested on a module basis prior to installation in the CDU, except modules 2007236, 2007238 or 2007243.

a. The modules shall be placed in a thermally controlled chamber, while energized, at ambient air temperatures of 50° ±5°F and 130° ±5°F for an hour at each temperature.

b. The electrical tests for the modules shall be performed in accordance with Table IV at each temperature specified in a.

4.3.3.2 Replaced Module Vibration Testing. Digital modules replaced shall be subjected to module level vibration prior to installation in the CDU, if the modules have not been subjected to vibration.

a. The modules, while energized, shall be subjected to a vibration sweep from 10 to 2000 cps at a rate of 4 octaves per minute. The magnitude of the vibration shall be 6g rms limited to a 0.4 inch pp constant displacement from 10 cps to the crossover frequency.

TABLE I

TRAY SEPARATION

TEST PARAGRAPH OF PS2007222	EXCEPTIONS AND TEST CONDITIONS
4.2.1.1.1	Not required
4.2.1.3	3.2.1 and 3.2.2.1 only
4.2.1.5.1	28±1 vdc DC Supply voltage only applied
4.3.2	Not required
4.3.4	Use only the following resolver angles specified in Table III 1X 16X 0° 0° 5.6° 90° 168.7° 180° 331.8° 270°
4.3.15	Use only the NULL, 2^7, $2^7.2^8$ EC&L Counter conditions specified in Table II
4.3.21	Use only the 1XRS and 16XRS/64XRS resolver inputs in Table IX. 1XRS 16XRS/64XRS 0° 0° 5.6° 90° 11.25° 180° 16.8° 270° 22.5° 360° 90° 0° 270° 0°
4.3.22	Not required
4.3.23	Not required
4.3.24	Not required

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7-20-67	C	34190	4, 5, 7, 8, 9	MGM SB	-

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4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the CDU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the CDU shall be subjected to complete testing in accordance with Section 4 of Specification PS2007222 except that the tests in 4.3.2 and 4.3.24 shall not be performed unless a tray is replaced, or if a module is replaced, the requirements of 4.3.3 shall apply in addition to the requirements of this paragraph.

4.3 MINIMUM RETEST. The CDU shall be subjected to the following applicable test(s) only when Minimum Retest is specified by the ARRO. Figure 1 may be used as a reference to locate the specified modules.

4.3.1 "S" or "X" Trays. If either the "S" or "X" trays were repaired or replaced, all tests specified in Specification PS2007222 shall be performed or retest shall be as specified by the ARRO.

4.3.2 Tray Separation. In the event of tray separation, Paragraphs 3.2.1, 3.2.2.1, 4.3.4, 4.3.6, 4.3.14, 4.3.18, 4.3.19 and 4.3.20 of Specification PS2007222 shall be accomplished. The tests of Section 4 stated above are to be run only at 28.0±1.0 vdc per Paragraph 4.2.1.5.a of Specification PS2007222. In addition, the CA tests of Appendix I of this specification shall be performed.

4.3.3 Module Replacement. Following module replacement, the applicable tests in accordance with Table I shall be performed, on the axis of module replacement only, in addition to the tests specified in 4.3.2, 4.3.3.1, and 4.3.3.2. Five modules may be replaced without CDU thermal testing. Any one CDU axis with two or more modules replaced, any two of which interface, requires that axis to be retested in accordance with paragraph 4.3.24 of Specification PS2007222. Interfacing modules are defined in Table II. If module (Drawing No.'s) 2007236, 2007238 or 2007243 are replaced, paragraph 4.3.24 of PS2007222 shall be rerun for the CDU Axis of replacement.

4.3.3.1 Replaced Module Thermal Testing. Analog modules replaced shall be thermally tested on a module basis prior to installation in the CDU, except modules 2007236, 2007238 or 2007243.

a. The modules shall be placed in a thermally controlled chamber, while energized, at ambient air temperatures of 50° ± 5°F and 130° ± 5°F for an hour at each temperature.

b. The electrical tests for the modules shall be performed in accordance with Table III at each temperature specified in a.

4.3.3.2 Replaced Module Vibration Testing. Digital modules replaced shall be subjected to module level vibration prior to installation in the CDU, if the modules have not been subjected to vibration.

a. The modules, while energized, shall be subjected to a vibration sweep from 10 to 2000 cps at a rate of 4 octaves per minute. The magnitude of the vibration shall be 6g rms limited to a 0.4 inch pp constant displacement from 10 cps to the crossover frequency.

b. The electrical tests for the modules during vibration shall be performed in accordance with the Test Procedures for the modules specified in Table III.

5. PREPARATION FOR DELIVERY

5.1 GENERAL. Preparation for delivery shall be in accordance with Specification ND1002214.

6. NOTES. None.

TABLE I

TEST SELECTION

REPLACED MODULE	APPLICABLE TEST PARAGRAPH OF PS2007222
2007139 ERROR ANGLE COUNTER & LOGIC	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.15, 4.3.16, 4.3.18, 4.3.20 and 4.3.11
2007140 READ COUNTER	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.16, 4.3.18, and 4.3.21
2007141 ** DIGITAL MODE	4.3.4, 4.3.5, 4.3.6, 4.3.7, 4.3.8, 4.3.16, 4.3.13* and 4.3.18
2007142 ** POWER SUPPLY	4.3.6 and 4.3.4(modified as indicated in Table I of this specification)
2007236 COARSE SYSTEM	4.3.4, 4.3.10, 4.3.11.3, 4.3.11.4,4.3.12,4.3.14.2, 4.3.18, 4.3.19, 4.3.21, 4.3.23,4.3.17.4 and 4.3.24
2007237 D/A CONVERTER	4.3.13, 4.3.15, 4.3.16, 4.3.17 and 4.3.20
2007238 MSA & QUAD REJECT.	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.17.1, 4.3.21, 4.3.23 and 4.3.24
2007243 QUADRANT SELECT	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.21, 4.3.23 and 4.3.24
2007254** MODE MODULE	4.3.5, 4.3.6, 4.3.8, 4.3.14, 4.3.16, 4.3.20 4.3.13 and 4.3.15
2007263** INTERROGATE	4.3.4, 4.3.13, 4.3.18.1, 4.3.14.3 and 4.3.23

* Amplitude and width only
** To be run on all 5 CDU Axes

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7-20-67	C	34190	4, 5, 7, 8, 9 RAL/AC	MGM SB	-
8-10-67	D	34318	7 RAL/AC	EA	--

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TABLE I

TEST SELECTION

REPLACED MODULE	APPLICABLE TEST PARAGRAPH OF PS2007222
2007139 ERROR ANGLE COUNTER & LOGIC	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.15, 4.3.16, 4.3.18, 4.3.20 and 4.3.11
2007140 READ COUNTER	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.16, 4.3.18, and 4.3.21
2007141 ** DIGITAL MODE	4.3.4, 4.3.5, 4.3.6, 4.3.7, 4.3.8, 4.3.16, 4.3.13* and 4.3.18
2007142 ** POWER SUPPLY	4.3.6 and 4.3.4(modified as indicated in Table I of this specification)
2007236 COARSE SYSTEM	4.3.4, 4.3.10, 4.3.11.3, 4.3.11.4,4.3.12,4.3.14.2, 4.3.18, 4.3.19, 4.3.21, 4.3.23,4.3.17.4 and 4.3.24
2007237 D/A CONVERTER	4.3.13, 4.3.15, 4.3.16, 4.3.17 and 4.3.20
2007238 MSA & QUAD REJECT.	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.17.1, 4.3.21, 4.3.23 and 4.3.24
2007243 QUADRANT SELECT	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.21, 4.3.23 and 4.3.24
2007254** MODE MODULE	4.3.5, 4.3.6, 4.3.8, 4.3.14, 4.3.16, 4.3.20 4.3.13 and 4.3.15
2007263** INTERROGATE	4.3.4, 4.3.13, 4.3.18.1, 4.3.14.3 and 4.3.23

* Amplitude and width only
** To be run on all 5 CDU Axes

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7-20-67	C	34190	4, 5, 7, 8, 9 RDG/AC	MGM SB	-
8-10-67	D	34318	7 RDG/AC	EA	--
9/14/67	E	34604	4, 7	MGM EA	--

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4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the CDU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO. In the event of tray separation, Para. 4.2.2 of PS2007222 must be accomplished prior to electrical testing.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the CDU shall be subjected to complete testing in accordance with Section 4 of Specification PS2007222 except that the tests in 4.3.2 and 4.3.24 shall not be performed unless a tray is replaced, or if a module is replaced, the requirements of 4.3.3 shall apply in addition to the requirements of this paragraph.

4.3 MINIMUM RETEST. The CDU shall be subjected to the following applicable test(s) only when Minimum Retest is specified by the ARRO. Figure 1 may be used as a reference to locate the specified modules.

4.3.1 "S" or "X" Trays. If either the "S" or "X" trays were repaired or replaced, all tests specified in Specification PS2007222 shall be performed or retest shall be as specified by the ARRO.

4.3.2 Tray Separation. In the event of tray separation,Paragraphs 3.2.1, 3.2.2.1, 4.3.4, 4.3.6, 4.3.14, 4.3.18, 4.3.19 and 4.3.20 of Specification PS2007222 shall be accomplished. The tests of Section 4 stated above are to be run only at 28.0±1.0 vdc per Paragraph 4.2.1.5.a of Specification PS2007222. When Para. 4.3.14.1 (PS2007222) is run at a B+ of 28.0 vdc the time for fail cease shall be ≤1.25 sec. In addition, the CA tests of Appendix I of this specification shall be performed.

4.3.3 Module Replacement. Following module replacement, the applicable tests in accordance with Table I shall be performed, on the axis of module replacement only, in addition to the tests specified in 4.3.2, 4.3.3.1, and 4.3.3.2. Five modules may be replaced without CDU thermal testing. Any one CDU axis with two or more modules replaced, any two of which interface, requires that axis to be retested in accordance with paragraph 4.3.24 of Specification PS2007222. Interfacing modules are defined in Table II. If module (Drawing No.'s) 2007236, 2007238 or 2007243 are replaced, paragraph 4.3.24 of PS2007222 shall be rerun for the CDU Axis of replacement.

4.3.3.1 Replaced Module Thermal Testing. Analog modules replaced shall be thermally tested on a module basis prior to installation in the CDU, except modules 2007236, 2007238 or 2007243.

a. The modules shall be placed in a thermally controlled chamber, while energized, at ambient air temperatures of 50° ± 5°F and 130° ± 5°F for an hour at each temperature.

b. The electrical tests for the modules shall be performed in accordance with Table III at each temperature specified in a.

4.3.3.2 Replaced Module Vibration Testing. Digital modules replaced shall be subjected to module level vibration prior to installation in the CDU if the modules have not been subjected to vibration.

TABLE I

TEST SELECTION

REPLACED MODULE	APPLICABLE TEST PARAGRAPH OF PS2007222
2007139 ERROR ANGLE COUNTER & LOGIC	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.15, 4.3.16, 4.3.18, 4.3.20 and 4.3.11
2007140 READ COUNTER	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.16, 4.3.18, and 4.3.21
2007141 ** DIGITAL MODE	4.3.4, 4.3.5, 4.3.6, 4.3.7, 4.3.8, 4.3.16, 4.3.13* and 4.3.18
2007142 ** POWER SUPPLY	4.3.6 and 4.3.4([illegible]
2007236 COARSE SYSTEM	4.3.4, 4.3.10, 4.3.11.3, 4.3.11.4,4.3.12,4.3.14.2, 4.3.18, 4.3.19, 4.3.21, 4.3.23,4.3.17.4 and 4.3.24
2007237 D/A CONVERTER	4.3.13, 4.3.15, 4.3.16, 4.3.17 and 4.3.20
2007238*** MSA & QUAD REJECT.	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.17.1, 4.3.21, 4.3.23 and 4.3.24
2007243*** QUADRANT SELECT	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.21, 4.3.23 and 4.3.24
2007254**,*** MODE MODULE	4.3.5, 4.3.6, 4.3.8, 4.3.14, 4.3.16, 4.3.20 4.3.13 and 4.3.15
2007263** INTERROGATE	4.3.4, 4.3.13, 4.3.18.1, 4.3.14.3 and 4.3.23

* Amplitude and width only
** To be run on all 5 CDU Axes
*** When Para 4.3.14.1 is run at B+ of 28 vdc, the time for fail cease shall be 1.25 sec max

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GFP RETEST SPECIFICATION

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Ⓒ					AC	NASA
Ⓜ	4/6/67	A	33512	2,4,7,8 RAG/AC	MGM EA	-
Ⓜ	5/11/67	B	33788	4, 7 JH/AC	MGM EA	-
Ⓒ	7-20-67	C	34190	4, 5, 7, 8, 9 RAG/AC	MGM SB	-
Ⓜ	8-10-67	D	34318	7 RAG/AC	EA	--
Ⓜ	9/14/67	E	34604	4, 7	MGM EA	--
	3/7/68	F	35823	4	MGM EA	--

This specification consists of page 1 to 9 inclusive.

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4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the CDU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO. In the event of tray separation, Para. 4.2.2 of PS2007222 must be accomplished prior to electrical testing.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the CDU shall be subjected to complete testing in accordance with Section 4 of Specification PS2007222 except that the tests in 4.3.2 and 4.3.24 shall not be performed unless a tray is replaced, or if a module is replaced, the requirements of 4.3.3 of this specification shall apply in addition to the requirements of this paragraph.

4.3 MINIMUM RETEST. The CDU shall be subjected to the following applicable test(s) only when Minimum Retest is specified by the ARRO. Figure 1 may be used as a reference to locate the specified modules.

4.3.1 "S" or "X" Trays. If either the "S" or "X" trays were repaired or replaced, all tests specified in Specification PS2007222 shall be performed or retest shall be as specified by the ARRO.

4.3.2 Tray Separation. In the event of tray separation, Paragraphs 3.2.1, 3.2.2.1, 4.3.4, 4.3.6, 4.3.14, 4.3.18, 4.3.19 and 4.3.20 of Specification PS2007222 shall be accomplished. The tests of Section 4 stated above are to be run only at 28.0±1.0 vdc per Paragraph 4.2.1.5.a of Specification PS2007222. When Para. 4.3.14.1 (PS2007222) is run at a B+ of 28.0 vdc the time for fail cease shall be ≤1.25 sec. In addition, the CA tests of Appendix I of this specification shall be performed.

4.3.3 Module Replacement. Following module replacement, the applicable tests in accordance with Table I shall be performed, on the axis of module replacement only, in addition to the tests specified in 4.3.2, 4.3.3.1, and 4.3.3.2. Five modules may be replaced without CDU thermal testing. Any one CDU axis with two or more modules replaced, any two of which interface, requires that axis to be retested in accordance with paragraph 4.3.24 of Specification PS2007222. Interfacing modules are defined in Table II. If module (Drawing No.'s) 2007236, 2007238 or 2007243 are replaced, paragraph 4.3.24 of PS2007222 shall be rerun for the CDU Axis of replacement.

4.3.3.1 Replaced Module Thermal Testing. Analog modules replaced shall be thermally tested on a module basis prior to installation in the CDU, except modules 2007236, 2007238 or 2007243.

a. The modules shall be placed in a thermally controlled chamber, while energized, at ambient air temperatures of 50° ± 5°F and 130° ± 5°F for an hour at each temperature.

b. The electrical tests for the modules shall be performed in accordance with Table III at each temperature specified in a.

4.3.3.2 Replaced Module Vibration Testing. Digital modules replaced shall be subjected to module level vibration prior to installation in the CDU, if the modules have not been subjected to vibration.

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7-20-67	C	34190	4, 5, 7, 8, 9	MGM SB	-
8-10-67	D	34318	7	EA	--
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4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the CDU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO. In the event of tray separation, Para. 4.2.2 of PS2007222 must be accomplished prior to electrical testing.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the CDU shall be subjected to complete testing in accordance with Section 4 of Specification PS2007222 except that the tests in 4.3.2 and 4.3.24 and 4.3.26, Noise Susceptibility, shall not be performed unless a tray is replaced, or if a module is replaced, the requirements of 4.3.3 of this specification shall apply in addition to the requirements of this paragraph.

4.3 MINIMUM RETEST. The CDU shall be subjected to the following applicable test(s) only when Minimum Retest is specified by the ARRO. Figure 1 may be used as a reference to locate the specified modules.

4.3.1 "S" or "X" Trays. If either the "S" or "X" trays were repaired or replaced, all tests specified in Specification PS2007222 shall be performed or retest shall be as specified by the ARRO.

4.3.2 Tray Separation. In the event of tray separation, Paragraphs 3.2.1, 3.2.2.1, 4.3.4, 4.3.6, 4.3.14, 4.3.18, 4.3.19 and 4.3.20 of Specification PS2007222 shall be accomplished. The tests of Section 4 stated above are to be run only at 28.0±1.0 vdc per Paragraph 4.2.1.5.a of Specification PS2007222. When Para. 4.3.14.1 (PS2007222) is run at a B+ of 28.0 vdc the time for fail cease shall be ≤1.25 sec. In addition, the CA tests of Appendix I of this specification shall be performed.

4.3.3 Module Replacement. Following module replacement, the applicable tests in accordance with Table I shall be performed, on the axis of module replacement only, in addition to the tests specified in 4.3.2, 4.3.3.1, and 4.3.3.2. Five modules may be replaced without CDU thermal testing. Any one CDU axis with two or more modules replaced, anv two of which interface, requires that axis to be retested in accordance with paragraph 4.3.24 of Specification PS2007222. Interfacing modules are defined in Table II. If module (Drawing No.'s) 2007236, 2007238 or 2007243 are replaced, paragraph 4.3.24 of PS2007222 shall be rerun for the CDU Axis of replacement.

4.3.3.1 Replaced Module Thermal Testing. Analog modules replaced shall be thermally tested on a module basis prior to installation in the CDU, except modules 2007236, 2007238 or 2007243.

a. The modules shall be placed in a thermally controlled chamber, while energized, at ambient air temperatures of 50° ± 5°F and 130° ± 5°F for an hour at each temperature.

b. The electrical tests for the modules shall be performed in accordance with Table III at each temperature specified in a.

4.3.3.2 Replaced Module Vibration Testing. Digital modules replaced shall be subjected to module level vibration prior to installation in the CDU if the modules have not been subjected to vibration.

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7-20-67	C	34190	4, 5, 7, 8, 9	MGM SB	-
8-10-67	D	34318	7	EA	--
9/14/67	E	34604	4, 7	MGM EA	--
3/7/68	F	35823	4	MGM EA	--
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This specification consists of page 1 to 9 inclusive.

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4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the CDU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO. In the event of tray separation, Para. 4.2.2 of PS2007222 must be accomplished prior to electrical testing.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the CDU shall be subjected to complete testing in accordance with Section 4 of Specification PS2007222 except that the tests in 4.3.2 and 4.3.24 and 4.3.26, Noise Susceptibility, shall not be performed unless a tray is replaced, or if a module is replaced, the requirements of 4.3.3 of this specification shall apply in addition to the requirements of this paragraph.

4.3 MINIMUM RETEST. The CDU shall be subjected to the following applicable test(s) only when Minimum Retest is specified by the ARRO. Figure 1 may be used as a reference to locate the specified modules.

4.3.1 "S" or "X" Trays. If either the "S" or "X" trays were repaired or replaced, all tests specified in Specification PS2007222 shall be performed or retest shall be as specified by the ARRO.

4.3.2 Tray Separation. In the event of tray separation, Paragraphs 3.2.1, 3.2.2.1, 4.3.4, 4.3.6, 4.3.14, 4.3.18, 4.3.19 and 4.3.20 of Specification PS2007222 shall be accomplished. The tests of Section 4 stated above are to be run only at 28.0±1.0 vdc per Paragraph 4.2.1.5.a of Specification PS2007222. When Para. 4.3.14.1 (PS2007222) is run at a B+ of 28.0 vdc the time for fail cease shall be ≤1.25 sec. In addition, the CA tests of Appendix I of this specification shall be performed.

4.3.3 Module Replacement. Following module replacement, the applicable tests in accordance with Table I shall be performed, on the axis of module replacement only, in addition to the tests specified in 4.3.2, 4.3.3.1, and 4.3.3.2. Five modules may be replaced without CDU thermal testing. Any one CDU axis with two or more modules replaced, any two of which interface, requires that axis to be retested in accordance with paragraph 4.3.24 of Specification PS2007222. Interfacing modules are defined in Table II.

4.3.3.1 Replaced Module Thermal Testing. Analog modules replaced shall be thermally tested on a module basis prior to installation in the CDU.

a. The modules shall be placed in a thermally controlled chamber, while energized, at ambient air temperatures of 50° ± 5°F and 130° ± 5°F for an hour at each temperature.

b. The electrical tests for the modules shall be performed in accordance with Table III at each temperature specified in a.

4.3.3.2 Replaced Module Vibration Testing. Digital modules replaced shall be subjected to module level vibration prior to installation in the CDU if the modules have not been subjected to vibration.

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8-10-67	D	34318	7 RDG/AC	EA	--
9/14/67	E	34604	4, 7	MGM EA	--
3/7/68	F	35823	4	MGM EA	--
9/17/68	G	36869	4	MGM EA	--
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4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the CDU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO. In the event of tray separation, Para. 4.2.2 of PS2007222 must be accomplished prior to electrical testing.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the CDU shall be subjected to complete testing in accordance with Section 4 of Specification PS2007222 except that the tests in 4.2.1.3, 4.3.2, 4.3.24 and 4.3.26, Noise Susceptibility, shall not be performed unless a tray is replaced, or if a module is replaced, the requirements of 4.3.3 of this specification shall apply in addition to the requirements of this paragraph.

4.3 MINIMUM RETEST. The CDU shall be subjected to the following applicable test(s) only when Minimum Retest is specified by the ARRO. Figure 1 may be used as a reference to locate the specified modules.

4.3.1 "S" or "X" Trays. If either the "S" or "X" trays were repaired or replaced, all tests specified in Specification PS2007222 shall be performed or retest shall be as specified by the ARRO.

4.3.2 Tray Separation. In the event of tray separation, Paragraphs 3.2.1, 3.2.2.1, 4.3.4, 4.3.6, 4.3.14, 4.3.18, 4.3.19 and 4.3.20 of Specification PS2007222 shall be accomplished. The tests of Section 4 stated above are to be run only at 28.0±1.0 vdc per Paragraph 4.2.1.5.a of Specification PS2007222. When Para, 4.3.14.1 (PS2007222) is run at a B+ of 28.0 vdc the time for fail cease shall be ≤1.25 sec. In addition, the CA tests of Appendix I of this specification shall be performed.

4.3.3 Module Replacement. Following module replacement, the applicable tests in accordance with Table I shall be performed, on the axis of module replacement only, in addition to the tests specified in 4.3.2, 4.3.3.1, and 4.3.3.2. Five modules may be replaced without CDU thermal testing. Any one CDU axis with two or more modules replaced, any two of which interface, requires that axis to be retested in accordance with paragraph 4.3.24 of Specification PS2007222. Interfacing modules are defined in Table II. [illegible]

4.3.3.1 Replaced Module Thermal Testing. Analog modules replaced shall be thermally tested on a module basis prior to installation in the CDU. [illegible]

a. The modules shall be placed in a thermally controlled chamber, while energized, at ambient air temperatures of 50° ± 5°F and 130° ± 5°F for an hour at each temperature.

b. The electrical tests for the modules shall be performed in accordance with Table III at each temperature specified in a.

4.3.3.2 Replaced Module Vibration Testing. Digital modules replaced shall be subjected to module level vibration prior to installation in the CDU, if the modules have not been subjected to vibration.

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1. SCOPE

1.1 PURPOSE. This specification establishes the test requirements for repaired GFP Coupling Data Units (CSM), hereafter called the CDU, which have been returned for repair or replacement of nonconforming subassemblies.

1.2 DEVIATIONS. Deviations from the requirements of this specification are permitted without waivers only as specified in the Apollo Repair Retest Order (ARRO) and as authorized by NASA/RASPO.

2. APPLICABLE DOCUMENTS

2.1 EFFECTIVE ISSUES. The following documents form a part of this specification to the extent specified herein.

SPECIFICATIONS

APOLLO G&N

ND1002214	General Specification for Preservation, Packaging, Packing and Container Marking of APOLLO Guidance and Navigation Major Assemblies, Assemblies, Subassemblies, Parts and Associated Ground Support Equipment
PS2007222	Procurement Specification, Product Configuration and Acceptance Test Requirements, Coupling Data Unit (CSM) Drawing No. 2007222

DRAWINGS

APOLLO G&N

2007090	Tray X Assembly
2007091	Tray S Assembly

add 2.2.

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the CDU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the CDU shall be subjected to complete testing in accordance with Section 4 of Specification PS2007222 except that the tests in 4.3.2 and 4.3.24 shall not be performed unless a tray is replaced.

4.3 MINIMUM RETEST. The CDU shall be subjected to the following applicable test(s) only when Minimum Retest is specified by the ARRO. Figure 1 may be used as a reference to locate the specified modules.

4.3.1 "S" or "X" Trays. If either the "S" or "X" trays were repaired or replaced, all tests specified in Specification PS2007222 shall be performed or retest shall be as specified by the ARRO.

4.3.2 Tray Separation. In the event of tray separation only, all tests for the IMU axes in Specification PS2007222 shall be performed with the exceptions and conditions specified in Table I of this specification.

4.3.3 Module Replacement. Following module replacement, the applicable tests in accordance with Table II shall be performed in addition to the tests specified in 4.3.2, 4.3.3.1, and 4.3.3.2. Five modules may be replaced without CDU thermal testing. Any one CDU axis with two or more modules replaced, any two of which interface, requires that axis to be retested in accordance with paragraph 4.3.24 of Specification PS2007222. Interfacing modules are defined in Table III. If module (Drawing No.'s) 2007236, 2007238 or 2007243 are replaced, paragraph 4.3.24 of PS2007222 shall be rerun for the CDU Axis of replacement.

4.3.3.1 Replaced Module Thermal Testing. Analog modules replaced shall be thermally tested on a module basis prior to installation in the CDU.

a. The modules shall be placed in a thermally controlled chamber, while energized, at ambient air temperatures of 50° ±5°F and 130° ±5°F for an hour at each temperature.

b. The electrical tests for the modules shall be performed in accordance with Table IV at each temperature specified in a.

4.3.3.2 Replaced Module Vibration Testing. Digital modules replaced shall be subjected to module level vibration prior to installation in the CDU, if the modules have not been subjected to vibration.

a. The modules, while energized, shall be subjected to a vibration sweep from 10 to 2000 cps at a rate of 4 octaves per minute. The magnitude of the vibration shall be 6g rms limited to a 0.4 inch pp constant displacement from 10 cps to the crossover frequency.

b. The electrical tests for the modules during vibration shall be performed in accordance with the Test Procedures for the modules specified in Table IV.

5. PREPARATION FOR DELIVERY

5.1 GENERAL. Preparation for delivery shall be in accordance with Specification ND1002214.

6. NOTES. None

TABLE I

TRAY SEPARATION

TEST PARAGRAPH OF PS2016142	EXCEPTIONS AND TEST CONDITIONS
4.2.1.1.1	Not required
4.2.1.3	Not required
4.2.1.5.1	28±1 vdc DC Supply voltage only applied
4.3.2	Not required
4.3.4	Use only the following resolver angles specified in Table III 1X 16X 0° 0° 5.6° 90° 168.7° 180° 331.8° 270°
4.3.15	Use only the NULL, 2^7, $2^7.2^8$ EC&L Counter conditions specified in Table II
4.3.21	Use only the 1XRS and 16XRS/64XRS resolver inputs in Table XI 1XRS 16XRS/64XRS 0° 0° 5.6° 90° 11.25° 180° 16.8° 270° 22.5° 360° 90° 0° 270° 0°
4.3.22	Not required
4.3.23	Not required
4.3.24	Not required

TABLE II

TEST SELECTION

REPLACED MODULE	APPLICABLE TEST PARAGRAPH OF PS2007222
2007139 ERROR ANGLE COUNTER & LOGIC	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.15, 4.3.16, 4.3.18, 4.3.20 and 4.3.21
2007140 READ COUNTER	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.16, 4.3.18, and 4.3.21
2007141 ** DIGITAL MODE	4.3.4, 4.3.5, 4.3.6, 4.3.7, 4.3.8, 4.3.16, 4.3.13* and 4.3.18
2007142 ** POWER SUPPLY	4.3.6 and 4.3.4(modified as indicated in Table I of this specification)
2007236 COARSE SYSTEM	4.3.4, 4.3.10, 4.3.11.3, 4.3.11.4, 4.3.12, 4.3.18, 4.3.19, 4.3.21, 4.3.23, 4.3.17.4 and 4.3.24
2007237 D/A CONVERTER	4.3.13, 4.3.15, 4.3.16, 4.3.17 and 4.3.20
2007238 MSA & QUAD REJECT.	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.17.1, 4.3.21, 4.3.23 and 4.3.24
2007243 QUADRANT SELECT	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.21, 4.3.23 and 4.3.24
2007254** MODE MODULE	4.3.5, 4.3.6, 4.3.8, 4.3.14, 4.3.18, 4.3.20 4.3.13 and 4.3.15
2007263** INTERROGATE	4.3.4, 4.3.13, 4.3.18.1, 4.3.14.3 and 4.3.23

* Amplitude and width only
** To be run on all 5 CDU Axes

TABLE III

INTERFACE *

	MODULE	MSA 1	D/A 2	CRS 3	Q.S. 4	P.S. 5	E.C. 6	R.C. 7	D.M. 8	A.M. 9	INT. 10
1	MSA		X		X		X	X		X	
2	D/A	X		X			X			X	
3	CRS		X				X	X		X	
4	Q.S.	X						X			
5	P.S.										
6	E.C.	X	X	X				X	X	X	X
7	R.C.	X		X	X		X		X	X	
8	D.M.						X	X		X	X
9	A.M.	X	X	X			X	X	X		
10	INT						X		X		

* If the replaced modules (per axis) are identified by (X) in Table III, CDU Thermal Retest (paragraph 4.3.24 of PS2007222) for that axis is required.

TABLE IV

ELECTRICAL TESTS

MODULE REPLACED		PROCUREMENT SPECIFICATION OR TEST PROCEDURE	APPLICABLE PARAGRAPHS
2007139	DIGITAL	PS2007139	(See NOTE below)
2007140		PS2007140	(See NOTE below)
2007141		PS2007141	(See NOTE below)
2007142	ANALOG	PS2007142	4.3
2007236		PS2007236	4.2.2
2007237		PS2007237	4.2.2
2007238		PS2007238	4.2.2
2007243		PS2007243	4.2.2
2007254		PS2007254	4.3.2
2007263		PS2007263	4.2.2

NOTE: All tests except the Thermal Extreme Operation tests in PS2007139, PS2007140 or PS2007141.

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GFP RETEST SPECIFICATION
FOR
COUPLING DATA UNITS (LEM)

Record of Revisions

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				AC	NASA
4/6/67	A	33512	2, 4, 7, 8	MGM EA	-

This specification consists of page 1 to 9 inclusive.

APPROVALS	NASA/MSC	wstame 28 Feb 67 MIT/IL	CCB 3/3/67	AC

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the CDU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the CDU shall be subjected to complete testing in accordance with Section 4 of Specification PS2016142 except that the tests in 4.3.2 and 4.3.24 shall not be performed unless a tray is replaced, or if a module is replaced, the requirements of 4.3.3 shall apply in addition to the requirements of this paragraph.

4.3 MINIMUM RETEST. The CDU shall be subjected to the following applicable test(s) only when Minimum Retest is specified by the ARRO. Figure 1 may be used as a reference to locate the specified modules.

4.3.1 "S" or "X" Trays. If either the "S" or "X" trays were repaired or replaced, all tests specified in Specification PS2016142 shall be performed or retest shall be as specified by the ARRO.

4.3.2 Tray Separation. In the event of tray separation only, all tests for the IMU axes in Specification PS2016142 shall be performed with the exceptions and conditions specified in Table I of this specification.

4.3.3 Module Replacement. Following module replacement, the applicable tests in accordance with Table II shall be performed in addition to the tests specified in 4.3.2, 4.3.3.1, and 4.3.3.2. Five modules may be replaced without CDU thermal testing. Any one CDU axis with two or more modules replaced, any two of which interface, requires that axis to be retested in accordance with paragraph 4.3.24 of Specification PS2016142. Interfacing modules are defined in Table III. If module (Drawing No.'s) 2007236, 2007238 or 2007243 are replaced, paragraph 4.3.24 of PS2016142 shall be rerun for the CDU Axis of replacement.

4.3.3.1 Replaced Module Thermal Testing. Analog modules replaced shall be thermally tested on a module basis prior to installation in the CDU, except modules 2007236, 2007238 or 2007243.

a. The modules shall be placed in a thermally controlled chamber, while energized, at ambient air temperatures of 50° ±5°F and 130° ±5°F for an hour at each temperature.

b. The electrical tests for the modules shall be performed in accordance with Table IV at each temperature specified in a.

4.3.3.2 Replaced Module Vibration Testing. Digital modules replaced shall be subjected to module level vibration prior to installation in the CDU, if the modules have not been subjected to vibration.

a. The modules, while energized, shall be subjected to a vibration sweep from 10 to 2000 cps at a rate of 4 octaves per minute. The magnitude of the vibration shall be 6g rms limited to a 0.4 inch pp constant displacement from 10 cps to the crossover frequency.

TABLE I

TRAY SEPARATION

TEST PARAGRAPH OF PS2016142	EXCEPTIONS AND TEST CONDITIONS
4.2.1.1.1	Not required
4.2.1.3	3.2.1 and 3.2.2.1 only
4.2.1.5.1	28±1 vdc DC Supply voltage only applied
4.3.2	Not required
4.3.4	Use only the following resolver angles specified in Table III 1X 16X 0° 0° 5.6° 90° 168.7° 180° 331.8° 270°
4.3.15	Use only the NULL, 2^7, $2^7.2^8$ EC&L Counter conditions specified in Table II
4.3.21	Use only the 1XRS and 16XRS resolver inputs in [illegible] Table XII 1XRS 16XRS 0° 0° 5.6° 90° 11.25° 180° 16.8° 270° 22.5° 360° 90° 0° 270° 0°
4.3.22	Not required
4.3.23	Not required
4.3.24	Not required

TABLE II

TEST SELECTION

REPLACED MODULE	APPLICABLE TEST PARAGRAPH OF PS2016142
2007139 ERROR ANGLE COUNTER & LOGIC	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.15, 4.3.16, 4.3.18, 4.3.20 and 4.3.11
2007140 READ COUNTER	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.16, 4.3.18, and 4.3.21
2007141** DIGITAL MODE	4.3.4, 4.3.5, 4.3.6, 4.3.7, 4.3.8, 4.3.16,4.3.13* and 4.3.18
2007142** POWER SUPPLY	4.3.6, and 4.3.4 (modified as indicated in Table I of this specification)
2007236 COARSE SYSTEM	4.3.4, 4.3.10, 4.3.11.3, 4.3.11.4, 4.3.12,4.3.14.2, 4.3.18, 4.3.19, 4.3.21, 4.3.23,4.3.17.4 and 4.3.24
2007237 D/A CONVERTER	4.3.13, 4.3.15, 4.3.16, 4.3.17 and 4.3.20
2007238 MSA & QUAD REJECT.	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.17.1, 4.3.21, 4.3.23 and 4.3.24
2007243 QUADRANT SELECT	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14,1,, 4.3.21, 4.3.23 and 4.3.24
2007254** MODE MODULE	4.3.5, 4.3.6, 4.3.8, 4.3.14, 4.3.16, 4.3.20 4.3.13 and 4.3.15
2007263** INTERROGATE	4.3.4, 4.3.13, 4.3.18.1, 4.3.14.3 and 4.3.23

* Amplitude and width only
** To be run on all 5 CDU Axes

[illegible]

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4/6/67	A	33512	2, 4, 7, 8 RG/AC	MGM EA	-
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This specification consists of page 1 to 9 inclusive.

APPROVALS	NASA/MSC	W Stameris 28 Feb 67 MIT/IL	CCB GA 3/3/67	AC

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the CDU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the CDU shall be subjected to complete testing in accordance with Section 4 of Specification PS2016142 except that the tests in 4.3.2 and 4.3.24 shall not be performed.unless a tray is replaced, or if a module is replaced, the requirements of 4.3.3 shall apply in addition to the requirements of this paragraph.

4.3 MINIMUM RETEST. The CDU shall be subjected to the following applicable test(s) only when Minimum Retest is specified by the ARRO. Figure 1 may be used as a reference to locate the specified modules.

4.3.1 "S" or "X" Trays. If either the "S" or "X" trays were repaired or replaced, all tests specified in Specification PS2016142 shall be performed or retest shall be as specified by the ARRO.

4.3.2 Tray Separation. In the event of tray separation only, all tests for the IMU axes in Specification PS2016142 shall be performed with the exceptions and conditions specified in Table I of this specification.

4.3.3 Module Replacement. Following module replacement, the applicable tests in accordance with Table II shall be performed, on the axis of module replacement only, in addition to the tests specified in 4.3.2, 4.3.3.1, and 4.3.3.2. Five modules may be replaced without CDU thermal testing. Any one CDU axis with two or more modules replaced, any two of which interface, requires that axis to be retested in accordance with paragraph 4.3.24 of Specification PS2016142. Interfacing modules are defined in Table III. If module (Drawing No.'s) 2007236, 2007238 or 2007243 are replaced, paragraph 4.3.24 of PS2016142 shall be rerun for the CDU Axis of replacement.

4.3.3.1 Replaced Module Thermal Testing. Analog modules replaced shall be thermally tested on a module basis prior to installation in the CDU, except modules 2007236, 2007238 or 2007243.

a. The modules shall be placed in a thermally controlled chamber, while energized, at ambient air temperatures of 50° ±5°F and 130° ±5°F for an hour at each temperature.

b. The electrical tests for the modules shall be performed in accordance with Table IV at each temperature specified in a.

4.3.3.2 Replaced Module Vibration Testing. Digital modules replaced shall be subjected to module level vibration prior to installation in the CDU, if the modules have not been subjected to vibration.

a. The modules, while energized, shall be subjected to a vibration sweep from 10 to 2000 cps at a rate of 4 octaves per minute. The magnitude of the vibration shall be 6g rms limited to a 0.4 inch pp constant displacement from 10 cps to the crossover frequency.

TABLE I

TRAY SEPARATION

<table>
<tr><th>TEST PARAGRAPH OF PS2016142</th><th>EXCEPTIONS AND TEST CONDITIONS</th></tr>
<tr><td>4.2.1.1.1</td><td>Not required</td></tr>
<tr><td>4.2.1.3</td><td>3.2.1 and 3.2.2.1 only</td></tr>
<tr><td>4.2.1.5.1</td><td>28±1 vdc DC Supply voltage only applied</td></tr>
<tr><td>4.3.2</td><td>Not required</td></tr>
<tr><td>4.3.4</td><td>Use only the following resolver angles specified in Table III
<table>
<tr><th>1X</th><th>16X</th></tr>
<tr><td>0°</td><td>0°</td></tr>
<tr><td>5.6°</td><td>90°</td></tr>
<tr><td>168.7°</td><td>180°</td></tr>
<tr><td>331.8°</td><td>270°</td></tr>
</table></td></tr>
<tr><td>4.3.15</td><td>Use only the NULL, 2^7, $2^7 . 2^8$ EC&L Counter conditions specified in Table II</td></tr>
<tr><td>4.3.21</td><td>Use only the 1XRS and 16XRS resolver inputs in [illegible] Table IX
<table>
<tr><th>1XRS</th><th>16XRS</th></tr>
<tr><td>0°</td><td>0°</td></tr>
<tr><td>5.6°</td><td>90°</td></tr>
<tr><td>11.25°</td><td>180°</td></tr>
<tr><td>16.8°</td><td>270°</td></tr>
<tr><td>22.5°</td><td>360°</td></tr>
<tr><td>90°</td><td>0°</td></tr>
<tr><td>270°</td><td>0°</td></tr>
</table></td></tr>
<tr><td>4.3.22</td><td>Not required</td></tr>
<tr><td>4.3.23</td><td>Not required</td></tr>
<tr><td>4.3.24</td><td>Not required</td></tr>
</table>

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4/6/67	A	33512	2,4,7,8	MGM EA	-
5/11/67	B	33789	4, 7	MGM EA	--
7/20/67	C	34191	4, 5, 7, 8, 9	MGM SB	--

This specification consists of page 1 to 9 inclusive.

APPROVALS	NASA/MSC	MIT/IL	CCB	AC

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the CDU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the CDU shall be subjected to complete testing in accordance with Section 4 of Specification PS2016142 except that the tests in 4.3.2 and 4.3.24 shall not be performed unless a tray is replaced, or if a module is replaced, the requirements of 4.3.3 shall apply in addition to the requirements of this paragraph.

4.3 MINIMUM RETEST. The CDU shall be subjected to the following applicable test(s) only when Minimum Retest is specified by the ARRO. Figure 1 may be used as a reference to locate the specified modules.

4.3.1 "S" or "X" Trays. If either the "S" or "X" trays were repaired or replaced, all tests specified in Specification PS2016142 shall be performed or retest shall be as specified by the ARRO.

4.3.2 Tray Separation. In the event of tray separation, paragraphs 3.2.1, 3.2.2.1, 4.3.4, 4.3.6. 4.3.13 (Presence of Lag Pulses only) 4.3.14, 4.3.18, 4.3.19 and 4.3.20 of Specification PS2016142, shall be accomplished. The tests of Section 4 stated above are to be run at 28.0±1.0 vdc per para 4.2.1.5.a of Specification PS2016142. In addition, the CA test of Appendix I of this specification shall be run.

4.3.3 Module Replacement. Following module replacement, the applicable tests in accordance with Table I shall be performed, on the axis of module replacement only, in addition to the tests specified in 4.3.2, 4.3.3.1, and 4.3.3.2. Five modules may be replaced without CDU thermal testing. Any one CDU axis with two or more modules replaced, any two of which interface, requires that axis to be retested in accordance with paragraph 4.3.24 of Specification PS2016142. Interfacing modules are defined in Table II. If module (Drawing No.'s) 2007236, 2007238 or 2007243 are replaced, paragraph 4.3.24 of PS2016142 shall be rerun for the CDU Axis of replacement.

4.3.3.1 Replaced Module Thermal Testing. Analog modules replaced shall be thermally tested on a module basis prior to installation in the CDU, except modules 2007236, 2007238 or 2007243.

a. The modules shall be placed in a thermally controlled chamber, while energized at ambient air temperatures of 50° ±5°F and 130° ±5°F for an hour at each temperature.

b. The electrical tests for the modules shall be performed in accordance with Table III at each temperature specified in a.

4.3.3.2 Replaced Module Vibration Testing. Digital modules replaced shall be subjected to module level vibration prior to installation in the CDU, if the modules have not been subjected to vibration.

a. The modules, while energized, shall be subjected to a vibration sweep from 10 to 2000 cps at a rate of 4 octaves per minute. The magnitude of the vibration shall be 6g rms limited to a 0.4 inch pp constant displacement from 10 cps to the crossover frequency.

b. The electrical tests for the modules during vibration shall be performed in accordance with the Test Procedures for the modules specified in Table III.

5. PREPARATION FOR DELIVERY

5.1 GENERAL. Preparation for delivery shall be in accordance with Specification ND1002214.

6. NOTES. None.

TABLE I.

TEST SELECTION

REPLACED MODULE	APPLICABLE TEST PARAGRAPH OF PS2016142
2007139 ERROR ANGLE COUNTER & LOGIC	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.15, 4.3.16, 4.3.18, 4.3.20 and 4.3.11
2007140 READ COUNTER	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.16, 4.3.18, and 4.3.21
2007141** DIGITAL MODE	4.3.4, 4.3.5, 4.3.6, 4.3.7, 4.3.8, 4.3.16,4.3.13* and 4.3.18
2007142** POWER SUPPLY	4.3.6, and 4.3.4 (modified as indicated in Table I of this specification)
2007236 COARSE SYSTEM	4.3.4, 4.3.10, 4.3.11.3, 4.3.11.4, 4.3.12,4.3.14.2, 4.3.18, 4.3.19, 4.3.21, 4.3.23, 4.3.17.4 and 4.3.24
2007237 D/A CONVERTER	4.3.13, 4.3.15, 4.3.16, 4.3.17 and 4.3.20
2007238 MSA & QUAD REJECT.	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.17.1, 4.3.21, 4.3.23 and 4.3.24
2007243 QUADRANT SELECT	4.3.4, 4.3.9. 4.3.11.1, 4.3.11.2, 4.3.14,1, 4.3.21, 4.3.23 and 4.3.24
2007254** MODE MODULE	4.3.5, 4.3.6, 4.3.8, 4.3.14, 4.3.16, 4.3.20 4.3.13 and 4.3.15
2007263** INTERROGATE	4.3.4, 4.3.13, 4.3.18.1, 4.3.14.3 and 4.3.23

* Amplitude and width only
** To be run on all 5 CDU Axes

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5/11/67	B	33789	4, 7 JH/AC	MGM EA	--
7/20/67	C	34191	4, 5, 7, 8, 9 RDG/AC	MGM SB	--
7/20/67	D	34192	9 RDG/AC	MGM SB	--

This specification consists of page 1 to 9 inclusive.

APPROVALS	NASA/MSC	wstamer 28 Feb 67 MIT/IL	CCB 3/3/67	RC AC JFDullenbarger

APPENDIX I

COARSE ALIGN TEST

1. COARSE ALIGN TEST. The following tests are to be run at nominal system reference and resolver excitation per Specification PS2016142. The dc supply shall be 24.0±0.5 vdc.

1.1 IMU-LEM

a. With the 1X and 16X resolvers set to 0°, CDUZ momentarily applied, and ISS CA and EEC applied (IMU), and 390 + $\Delta\theta_C$ pulses applied, the CA error shall be 150±37 mv rms total, $\pi\phi$. The DAC AC output shall be 5.112±5.5 percent 0ϕ. Apply CDUZ. With the 1X resolver adjusted to 16.9° and the 16X resolver adjusted to 270°, remove CDUZ. There shall be +1536±1$\Delta\theta G$ pulses generated, the CA error and DAC AC outputs shall be $\leq$10 mv rms.

b. Re-establish the initial conditions of a above. Apply 390 -$\Delta\theta_C$ pulses. The CA error output shall be 150±37 mv rms total 0ϕ. The DAC AC output shall be 5.112±5.5 percent $\pi\phi$. Apply CDUZ. With the 1X resolver adjusted to 343.1 and the 16X resolver adjusted to 90°, remove CDUZ. -1536±1$\Delta\theta G$ pulses shall be generated, the CA error and DAC AC outputs shall be $\leq$10 mv rms. The dc level at pin 611 shall be 20±5 vdc.

1.2 RR - LEM D/A. With D/A enable applied and the read counter counted up and down in accordance with Table I of this appendix, the ac and dc outputs shall be as specified therein except that the dc output shall not be present until DID is commanded. Maintain the RR 28.0V rms, 800 cps excitation as close to nominal as possible during this test.

TABLE I

DAC OUTPUT

EC&L COUNTER CONDITION	PULSES APPLIED	DC OUTPUT ± Volts	AC OUTPUT 0 or $\pi\phi$ V rms
Null	0	0.0000±5 mv	0.0000±5 mv
$2^5 2^7$	160	2.1100±1.5%	2.130±2%, ±5°
$2^7 2^8$	384	5.064±3.5%	5.112±5.5%

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4/6/67	A	33512	2, 4, 7, 8 RDG/AC	MGM EA	-
5/11/67	B	33789	4, 7 JH/AC	MGM EA	--
7/20/67	C	34191	4, 5, 7, 8, 9 RDG/AC	MGM SB	--
7/20/67	D	34192	9 RDG/AC	MGM SB	--
8/10/67	E	34319	7 RDG/AC	EA	--

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TABLE I.

TEST SELECTION

REPLACED MODULE	APPLICABLE TEST PARAGRAPH OF PS2016142
2007139 ERROR ANGLE COUNTER & LOGIC	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.15, 4.3.16, 4.3.18, 4.3.20 and 4.3.11
2007140 READ COUNTER	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.16, 4.3.18, and 4.3.21
2007141** DIGITAL MODE	4.3.4, 4.3.5, 4.3.6, 4.3.7, 4.3.8, 4.3.16,4.3.13* and 4.3.18
2007142** POWER SUPPLY	4.3.6, and 4.3.4.
2007236 COARSE SYSTEM	4.3.4, 4.3.10, 4.3.11.3, 4.3.11.4, 4.3.12,4.3.14.2, 4.3.18, 4.3.19, 4.3.21, 4.3.23,4.3.17.4 and 4.3.24
2007237 D/A CONVERTER	4.3.13, 4.3.15, 4.3.16, 4.3.17 and 4.3.20
2007238 MSA & QUAD REJECT.	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.17.1, 4.3.21, 4.3.23 and 4.3.24
2007243 QUADRANT SELECT	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.21, 4.3.23 and 4.3.24
2007254** MODE MODULE	4.3.5, 4.3.6, 4.3.8, 4.3.14, 4.3.16, 4.3.20 4.3.13 and 4.3.15
2007263** INTERROGATE	4.3.4, 4.3.13, 4.3.18.1, 4.3.14.3 and 4.3.23

* Amplitude and width only
** To be run on all 5 CDU Axes

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4/6/67	A	33512	2,4,7,8 RDG/AC	MGM EA	-
5/11/67	B	33789	4, 7 JH/AC	MGM EA	--
7/20/67	C	34191	4, 5, 7, 8, 9 RDG/AC	MGM SB	--
7/20/67	D	34192	9 RDG/AC	MGM SB	--
8/10/67	E	34319	7 RDG/AC	EA	--
9/14/67	F	34603	4, 7	MGM EA	--

This specification consists of page 1 to 9 inclusive.

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4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the CDU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO. In the event of tray separation, Para 4.2.2 of PS2016142 must be accomplished prior to electrical testing.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the CDU shall be subjected to complete testing in accordance with Section 4 of Specification PS2016142 except that the tests in 4.3.2 and 4.3.24 shall not be performed unless a tray is replaced, or if a module is replaced, the requirements of 4.3.3 shall apply in addition to the requirements of this paragraph.

4.3 MINIMUM RETEST. The CDU shall be subjected to the following applicable test(s) only when Minimum Retest is specified by the ARRO. Figure 1 may be used as a reference to locate the specified modules.

4.3.1 "S" or "X" Trays. If either the "S" or "X" trays were repaired or replaced, all tests specified in Specification PS2016142 shall be performed or retest shall be as specified by the ARRO.

4.3.2 Tray Separation. In the event of tray separation, paragraphs 3.2.1, 3.2.2.1, 4.3.4, 4.3.6, 4.3.13 (Presence of Lag Pulses only) 4.3.14, 4.3.18, 4.3.19 and 4.3.20 of Specification PS2016142, shall be accomplished. The tests of Section 4 stated above are to be run at 28.0±1.0 vdc per para 4.2.1.5.a of Specification PS2016142. When Para 4.3.14.1 (PS2016142) is run at a B+ of 28.0±1 vdc, the time for fail cease shall be ≤1.25 sec. In addition, the CA test of Appendix I of this specification shall be run.

4.3.3 Module Replacement. Following module replacement, the applicable tests in accordance with Table I shall be performed, on the axis of module replacement only, in addition to the tests specified in 4.3.2, 4.3.3.1, and 4.3.3.2. Five modules may be replaced without CDU thermal testing. Any one CDU axis with two or more modules replaced, any two of which interface, requires that axis to be retested in accordance with paragraph 4.3.24 of Specification PS2016142. Interfacing modules are defined in Table II. If module (Drawing No.'s) 2007236, 2007238 or 2007243 are replaced, paragraph 4.3.24 of PS2016142 shall be rerun for the CDU Axis of replacement.

4.3.3.1 Replaced Module Thermal Testing. Analog modules replaced shall be thermally tested on a module basis prior to installation in the CDU, except modules 2007236, 2007238 or 2007243.

a. The modules shall be placed in a thermally controlled chamber, while energized at ambient air temperatures of 50° ±5°F and 130° ±5°F for an hour at each temperature.

b. The electrical tests for the modules shall be performed in accordance with Table III at each temperature specified in a.

TABLE I.

TEST SELECTION

REPLACED MODULE	APPLICABLE TEST PARAGRAPH OF PS2016142
2007139 ERROR ANGLE COUNTER & LOGIC	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.15, 4.3.16, 4.3.18, 4.3.20 and 4.3.11
2007140 READ COUNTER	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.16, 4.3.18, and 4.3.21
2007141** DIGITAL MODE	4.3.4, 4.3.5, 4.3.6, 4.3.7, 4.3.8, 4.3.16, 4.3.13* and 4.3.18
2007142** POWER SUPPLY	4.3.6, and 4.3.4.
2007236 COARSE SYSTEM	4.3.4, 4.3.10, 4.3.11.3, 4.3.11.4, 4.3.12, 4.3.14.2, 4.3.18, 4.3.19, 4.3.21, 4.3.23, 4.3.17.4 and 4.3.24
2007237 D/A CONVERTER	4.3.13, 4.3.15, 4.3.16, 4.3.17 and 4.3.20
2007238*** MSA & QUAD REJECT.	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.17.1, 4.3.21, 4.3.23 and 4.3.24
2007243*** QUADRANT SELECT	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.21, 4.3.22 and 4.3.24
2007254**, *** MODE MODULE	4.3.5, 4.3.6, 4.3.8, 4.3.14, 4.3.16, 4.3.20 4.3.13 and 4.3.15
2007263** INTERROGATE	4.3.4, 4.3.13, 4.3.18.1, 4.3.14.3 and 4.3.23

* Amplitude and width only
** To be run on all 5 CDU Axes
*** When Para 4.3.14.1 is run at B+ of 28 vdc, the time for fail cease shall be 1.25 sec max

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GFP RETEST SPECIFICATION

FOR

COUPLING DATA UNITS (LEM)

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				AC	NASA
4/6/67	A	33512	2, 4, 7, 8 RDG/AC	MGM EA	-
5/11/67	B	33789	4, 7 EH/AC	MGM EA	--
7/20/67	C	34191	4, 5, 7, 8, 9 RDG/AC	MGM SB	--
7/20/67	D	34192	9 RDG/AC	MGM SB	--
8/10/67	E	34319	7 RDG/AC	EA	--
9/14/67	F	34603	4, 7	MGM EA	--
3/7/68	G	35824	4	MGM EA	--

This specification consists of page 1 to 9 inclusive.

APPROVALS	NASA/MSC	W Stamer 28 Feb 67 MIT/IL	CCB 64 3/3/67	AC

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the CDU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO. In the event of tray separation, Para 4.2.2 of PS2016142 must be accomplished prior to electrical testing.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the CDU shall be subjected to complete testing in accordance with Section 4 of Specification PS2016142 except that the tests in 4.3.2 and 4.3.24 shall not be performed unless a tray is replaced, or if a module is replaced, the requirements of 4.3.3 of this specification shall apply in addition to the requirements of this paragraph.

4.3 MINIMUM RETEST. The CDU shall be subjected to the following applicable test(s) only when Minimum Retest is specified by the ARRO. Figure 1 may be used as a reference to locate the specified modules.

4.3.1 "S" or "X" Trays. If either the "S" or "X" trays were repaired or replaced, all tests specified in Specification PS2016142 shall be performed or retest shall be as specified by the ARRO.

4.3.2 Tray Separation. In the event of tray separation, paragraphs 3.2.1, 3.2.2.1, 4.3.4, 4.3.6, 4.3.13 (Presence of Lag Pulses only) 4.3.14, 4.3.18, 4.3.19 and 4.3.20 of Specification PS2016142, shall be accomplished. The tests of Section 4 stated above are to be run at 28.0±1.0 vdc per para 4.2.1.5.a of Specification PS2016142. When Para 4.3.14.1 (PS2016142) is run at a B+ of 28.0±1 vdc, the time for fail cease shall be ≤1.25 sec. In addition, the CA test of Appendix I of this specification shall be run.

4.3.3 Module Replacement. Following module replacement, the applicable tests in accordance with Table I shall be performed, on the axis of module replacement only, in addition to the tests specified in 4.3.2, 4.3.3.1, and 4.3.3.2. Five modules may be replaced without CDU thermal testing. Any one CDU axis with two or more modules replaced, any two of which interface, requires that axis to be retested in accordance with paragraph 4.3.24 of Specification PS2016142. Interfacing modules are defined in Table II. If module (Drawing No.'s) 2007236, 2007238 or 2007243 are replaced, paragraph 4.3.24 of PS2016142 shall be rerun for the CDU Axis of replacement.

4.3.3.1 Replaced Module Thermal Testing. Analog modules replaced shall be thermally tested on a module basis prior to installation in the CDU, except modules 2007236, 2007238 or 2007243.

a. The modules shall be placed in a thermally controlled chamber, while energized at ambient air temperatures of 50° ±5°F and 130° ±5°F for an hour at each temperature.

b. The electrical tests for the modules shall be performed in accordance with Table III at each temperature specified in a.

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GFP RETEST SPECIFICATION

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COUPLING DATA UNITS (LEM)

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4/6/67	A	33512	2, 4, 7, 8	MGM EA	-
5/11/67	B	33789	4, 7 JH/AC	MGM EA	--
7/20/67	C	34191	4, 5, 7, 8, 9	MGM SB	--
7/20/67	D	34192	9	MGM SB	--
8/10/67	E	34319	7	EA	—
9/14/67	F	34603	4, 7	MGM EA	--
3/7/68	G	35824	4	MGM EA	--
9/27/68	H	36870	4	MGM EA	--

This specification consists of page 1 to 9 inclusive.

APPROVALS	NASA/MSC	W Stameri 28 Feb 67 MIT/IL	CCB 64 3/1/67	AC

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the CDU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO. In the event of tray separation, Para 4.2.2 of PS2016142 must be accomplished prior to electrical testing.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the CDU shall be subjected to complete testing in accordance with Section 4 of Specification PS2016142 except that the tests in 4.3.2, 4.3.24 and 4.3.26, Noise Susceptibility, shall not be performed unless a tray is replaced, or if a module is replaced, the requirements of 4.3.3 of this specification shall apply in addition to the requirements of this paragraph.

4.3 MINIMUM RETEST. The CDU shall be subjected to the following applicable test(s) only when Minimum Retest is specified by the ARRO. Figure 1 may be used as a reference to locate the specified modules.

4.3.1 "S" or "X" Trays. If either the "S" or "X" trays were repaired or replaced, all tests specified in Specification PS2016142 shall be performed or retest shall be as specified by the ARRO.

4.3.2 Tray Separation. In the event of tray separation, paragraphs 3.2.1, 3.2.3.1, 4.3.4, 4.3.6, 4.3.13 (Presence of Lag Pulses only) 4.3.14, 4.3.18, 4.3.19 and 4.3.20 of Specification PS2016142, shall be accomplished. The tests of Section 4 stated above are to be run at 28.0±1.0 vdc per para 4.2.1.5.a of Specification PS2016142. When Para 4.3.14.1 (PS2016142) is run at a B+ of 28.0±1 vdc, the time for fail cease shall be ≤1.25 sec. In addition, the CA test of Appendix I of this specification shall be run.

4.3.3 Module Replacement. Following module replacement, the applicable tests in accordance with Table I shall be performed, on the axis of module replacement only, in addition to the tests specified in 4.3.2, 4.3.3.1, and 4.3.3.2. Five modules may be replaced without CDU thermal testing. Any one CDU axis with two or more modules replaced, any two of which interface, requires that axis to be retested in accordance with paragraph 4.3.24 of Specification PS2016142. Interfacing modules are defined in Table II. If module (Drawing No.'s) 2007236, 2007238 or 2007243 are replaced, paragraph 4.3.24 of PS2016142 shall be rerun for the CDU Axis of replacement.

4.3.3.1 Replaced Module Thermal Testing. Analog modules replaced shall be thermally tested on a module basis prior to installation in the CDU, except modules 2007236, 2007238 or 2007243.

a. The modules shall be placed in a thermally controlled chamber, while energized at ambient air temperatures of 50° ±5°F and 130° ±5°F for an hour at each temperature.

b. The electrical tests for the modules shall be performed in accordance with Table III at each temperature specified in a.

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GFP RETEST SPECIFICATION

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COUPLING DATA UNITS (LEM)

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4/3/67	A	33512	2,4,7,8	MGM EA	-
5/11/67	B	33789	4, 7	MGM EA	--
7/20/67	C	34191	4, 5, 7, 8, 9	MGM SB	--
7/20/67	D	34192	9	MGM SB	--
8/10/67	E	34319	7	EA	--
9/14/67	F	34603	4, 7	MGM EA	--
3/7/68	G	35824	4	MGM EA	--
9/27/68	H	36870	4	MGM EA	--
11/6/68	J	36999	4,7	MGM EA	- -

This specification consists of page 1 to 9 inclusive.

APPROVALS	NASA/MSC	w stamer 28 Feb 67 MIT/IL	CCB 3/3/67	AC

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the CDU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO. In the event of tray separation, Para 4.2.2 of PS2016142 must be accomplished prior to electrical testing.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the CDU shall be subjected to complete testing in accordance with Section 4 of Specification PS2016142 except that the tests in 4.3.2, 4.3.24 and 4.3.26, Noise Susceptibility, shall not be performed unless a tray is replaced, or if a module is replaced, the requirements of 4.3.3 of this specification shall apply in addition to the requirements of this paragraph.

4.3 MINIMUM RETEST. The CDU shall be subjected to the following applicable test(s) only when Minimum Retest is specified by the ARRO. Figure 1 may be used as a reference to locate the specified modules.

4.3.1 "S" or "X" Trays. If either the "S" or "X" trays were repaired or replaced, all tests specified in Specification PS2016142 shall be performed or retest shall be as specified by the ARRO.

4.3.2 Tray Separation. In the event of tray separation, paragraphs 3.2.1, 3.2.2.1, 4.3.4, 4.3.6, 4.3.13 (Presence of Lag Pulses only) 4.3.14, 4.3.18, 4.3.19 and 4.3.20 of Specification PS2016142, shall be accomplished. The tests of Section 4 stated above are to be run at 28.0±1.0 vdc per para 4.2.1.5.a of Specification PS2016142. When Para 4.3.14.1 (PS2016142) is run at a B+ of 28.0±1 vdc, the time for fail cease shall be ≤1.25 sec. In addition, the CA test of Appendix I of this specification shall be run.

4.3.3 Module Replacement. Following module replacement, the applicable tests in accordance with Table I shall be performed, on the axis of module replacement only, in addition to the tests specified in 4.3.2, 4.3.3.1, and 4.3.3.2. Five modules may be replaced without CDU thermal testing. Any one CDU axis with two or more modules replaced, any two of which interface, requires that axis to be retested in accordance with paragraph 4.3.24 of Specification PS2016142. Interfacing modules are defined in Table II.

4.3.3.1 Replaced Module Thermal Testing. Analog modules replaced shall be thermally tested on a module basis prior to installation in the CDU

a. The modules shall be placed in a thermally controlled chamber, while energized at ambient air temperatures of 50° ±5°F and 130° ±5°F for an hour at each temperature.

b. The electrical tests for the modules shall be performed in accordance with Table III at each temperature specified in a.

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GFP RETEST SPECIFICATION
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COUPLING DATA UNITS (LEM)

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				AC	NASA
4/6/67	A	33512	2,4,7,8 RDG/AC	MGM EA	-
5/11/67	B	33789	4, 7 JH/AC	MGM EA	--
7/20/67	C	34191	4, 5, 7, 8, 9 RDG/AC	MGM SB	--
7/20/67	D	34192	9 RDG/AC	MGM SB	--
8/10/67	E	34319	7 RDG/AC	EA	--
9/14/67	F	34603	4, 7	MGM EA	--
3/7/68	G	35824	4 /AC	MGM EA	--
9/27/68	H	36870	4 /AC	MGM EA	--
11/6/68	J	36999	4, 7 /AC	MGM EA	- -
12/19/68	K	37135	4 /AC	MGM EA	- -

This specification consists of page 1 to 9 inclusive.

APPROVALS	NASA/MSC	W Stameris 28 Feb 67 MIT/IL	CCB 3/3/67	AC

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GFP RETEST SPECIFICATION

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COUPLING DATA UNITS (LEM)

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This specification consists of page 1 to 9 inclusive.

APPROVALS	NASA/MSC	28 Feb 67 MIT/IL	CCB	ACSP

1. SCOPE

1.1 PURPOSE. This specification establishes the test requirements for repaired GFP Coupling Data Units (LEM), hereafter called the CDU, which have been returned for repair or replacement of nonconforming subassemblies.

1.2 DEVIATIONS. Deviations from the requirements of this specification are permitted without waivers only as specified in the Apollo Repair Retest Order (ARRO) and as authorized by NASA/RASPO.

2. APPLICABLE DOCUMENTS

2.1 EFFECTIVE ISSUES. The following documents form a part of this specification to the extent specified herein.

SPECIFICATIONS

APOLLO G&N

ND1002214	General Specification for Preservation, Packaging, Packing and Container Marking of APOLLO Guidance and Navigation Major Assemblies, Assemblies, Subassemblies, Parts and Associated Ground Support Equipment
PS2016142	Procurement Specification, Product Configuration and Acceptance Test Requirements, Coupling Data Unit (LEM), Drawing No. 2007222

DRAWINGS

APOLLO G&N

2007090	Tray X Assembly
2007091	Tray S Assembly

add 2.2

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the CDU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the CDU shall be subjected to complete testing in accordance with Section 4 of Specification PS2016142 except that the tests in 4.3.2 and 4.3.24 shall not be performed.unless a tray is replaced.

4.3 MINIMUM RETEST. The CDU shall be subjected to the following applicable test(s) only when Minimum Retest is specified by the ARRO. Figure 1 may be used as a reference to locate the specified modules.

4.3.1 "S" or "X" Trays. If either the "S" or "X" trays were repaired or replaced, all tests specified in Specification PS2016142 shall be performed or retest shall be as specified by the ARRO.

4.3.2 Tray Separation. In the event of tray separation only, all tests for the IMU axes in Specification PS2016142 shall be performed with the exceptions and conditions specified in Table I of this specification.

4.3.3 Module Replacement. Following module replacement, the applicable tests in accordance with Table II shall be performed in addition to the tests specified in 4.3.2, 4.3.3.1, and 4.3.3.2. Five modules may be replaced without CDU thermal testing. Any one [illegible] . Any one CDU axis with two or more modules replaced, any two of which interface, requires that axis to be retested in accordance with paragraph 4.3.24 of Specification PS2016142. Interfacing modules are defined in Table III, If module (Drawing No.'s) 2007236, 2007238 or 2007243 are replaced, paragraph 4.3.24 of PS2016142 shall be rerun for the CDU Axis of replacement.

4.3.3.1 Replaced Module Thermal Testing. Analog modules replaced shall be thermally tested on a module basis prior to installation in the CDU.

a. The modules shall be placed in a thermally controlled chamber, while energized, at ambient air temperatures of 50° ±5°F and 130° ±5°F for an hour at each temperature.

b. The electrical tests for the modules shall be performed in accordance with Table IV at each temperature specified in a.

4.3.3.2 Replaced Module Vibration Testing. Digital modules replaced shall be subjected to module level vibration prior to installation in the CDU, if the modules have not been subjected to vibration.

a. The modules, while energized, shall be subjected to a vibration sweep from 10 to 2000 cps at a rate of 4 octaves per minute. The magnitude of the vibration shall be 6g rms limited to a 0.4 inch pp constant displacement from 10 cps to the crossover frequency.

b. The electrical tests for the modules during vibration shall be performed in accordance with the Test Procedures for the modules specified in Table IV.

5. PREPARATION FOR DELIVERY

5.1 GENERAL. Preparation for delivery shall be in accordance with Specification ND1002214.

6. NOTES. None

TABLE I

TRAY SEPARATION

TEST PARAGRAPH OF PS2016142	EXCEPTIONS AND TEST CONDITIONS
4.2.1.1.1	Not required
4.2.1.3	Not required
4.2.1.5.1	28±1 vdc DC Supply voltage only applied
4.3.2	Not required
4.3.4	Use only the following resolver angles specified in Table III 1X — 16X 0° — 0° 5.6° — 90° 168.7° — 180° 331.8° — 270°
4.3.15	Use only the NULL, 2^7, $2^7 . 2^8$ EC&L Counter conditions specified in Table II
4.3.21	Use only the 1XRS and 16XRS resolver inputs inputs in Table XII 1XRS — 16XRS 0° — 0° 5.6° — 90° 11.25° — 180° 16.8° — 270° 22.5° — 360° 90° — 0° 270° — 0°
4.3.22	Not required
4.3.23	Not required
4.3.24	Not required

TABLE II

TEST SELECTION

REPLACED MODULE	APPLICABLE TEST PARAGRAPH OF PS2016142
2007139 ERROR ANGLE COUNTER & LOGIC	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.15, 4.3.16, 4.3.16, 4.3.20 and 4.3.11
2007140 READ COUNTER	4.3.4, 4.3.5, 4.3.7, 4.3.8, 4.3.12, 4.3.13,* 4.3.10, 4.3.18, and 4.3.21
2007141** DIGITAL MODE	4.3.4, 4.3.5, 4.3.6, 4.3.7, 4.3.8, 4.3.16, 4.3.13* and 4.3.18
2007142** POWER SUPPLY	4.3.6, and 4.3.4 (modified as indicated in Table II of this specification) ...le I of this specification)
2007236 COARSE SYSTEM	4.3.4, 4.3.10, 4.3.11.3, 4.3.11.4, 4.3.12, 4.3.16, 4.3.19, 4.3.21, 4.3.23, 4.3.17.4 and 4.3.24
2007237 D/A CONVERTER	4.3.13, 4.3.15, 4.3.16, 4.3.17 and 4.3.20
2007238 MSA & QUAD REJECT.	4.3.4, 4.3.8, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.17.1, 4.3.21, 4.3.23 and 4.3.24
2007242 QUADRANT SELECT	4.3.4, 4.3.9, 4.3.11.1, 4.3.11.2, 4.3.14.1, 4.3.21, 4.3.23 and 4.3.24
2007254** MODE MODULE	4.3.5, 4.3.6, 4.3.8, 4.3.14, 4.3.16, 4.3.20 4.3.13 and 4.3.15
2007263** INTERROGATE	4.3.4, 4.3.13, 4.3.18.1, 4.3.14.3 and 4.3.23

* Amplitude and width only
** To be run on all 5 CDU Axes

TABLE III

INTERFACE *

	MODULE	MSA 1	D/A 2	CRS 3	Q.S. 4	P.S. 5	E.C. 6	R.C. 7	D.M. 8	A.M. 9	INT. 10
1	MSA		X		X		X	X		X	
2	D/A	X		X			X			X	
3	CRS		X				X	X		X	
4	Q.S.	X						X			
5	P.S.										
6	E.C.	X	X	X				X	X	X	X
7	R.C.	X		X	X		X		X	X	
8	D.M.						X	X		X	X
9	A.M.	X	X	X			X	X	X		
10	INT						X		X		

* If the replaced modules (per axis) are identified by (X) in Table III, CDU Thermal Retest (paragraph 4.3.24 of PS2016142) for that axis is required.

TABLE IV

ELECTRICAL TESTS

MODULE REPLACED	PROCUREMENT SPECIFICATION OR TEST PROCEDURE	APPLICABLE PARAGRAPHS
2007139	PS2007139	(See NOTE below)
2007140 DIGITAL	PS2007140	(See NOTE below)
2007141	PS2007141	(See NOTE below)
2007142	PS2007142	4.5
2007236	PS2007236	4.2.2
2007237	PS2007237	4.2.2
2007238 ANALOG	PS2007238	4.2.2
2007243	PS2007243	4.2.2
2007254	PS2007254	4.2.2
2007263	PS2007263	4.2.2

* NOTE: All tests except the Thermal Extreme Operation tests in PS2007139, PS2007140 or PS2007141.

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FOR

GUIDANCE AND NAVIGATION SYSTEMS

(BLOCK II)

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				AC	NASA
12/27/68	A	37163	2, 5-19. Specification was 17 pages, now 19 pages.	MGM EA	--

This specification consists of page 1 to 19 inclusive.

APPROVALS	NASA/MSC	W Stameris 6 Apr 67 MIT/IL 3/27/67	T.A. Stover AC

TABLES I THROUGH XI

TABLE II (Continued)

COMPONENT	MODULE	SUBSYSTEM TEST	JDC 12202	JDC 12205	JDC 12206	JDC 12207	JDC 12208	JDC 12209	JDC 12210	JDC 12211	JDC 12212	JDC 12213	JDC 12214	JDC 12216	JDC 12217	JDC 12218	JDC 12219	JDC 12220	JDC 12221	JDC 12222
	X PIP 2018639	X			X										X	X				X
	Y PIP 2018639	X			X										X	X				X
	Z PIP 2018639	X			X										X	X				X
	IG TORQUE MOTOR 2018623	X			X													X		
	MG TORQUE MOTOR 2018623	X			X													X		
	OG TORQUE MOTOR 2018629	X			X													X		
	IG RESOLVER 2018631	X												X						
	MG RESOLVER 2018631	X												X						
	OG RESOLVER 2018631	X												X						
	SM"A" HARNESS 2018828	X	X		X									X	X	X	X	X		
	HEATER & TAPERED MOUNT 2018741	X		X		X														
	IG SLIP RINGS 2018634	X	X		X									X	X	X	X	X		
	MG SLIP RINGS 2018624	X	X		X									X	X	X	X	X		
	RSVR GYRO ERROR 2018632	X			X									X	X	X	X	X		
	BLOWER 2018644	X		X		X														
	"B" HARNESS 2018797	X	X		X									X	X	X	X	X		
	"C" HARNESS 2018798	X	X		X									X	X	X	X	X		
	OG SLIP RINGS 2018625	X	X		X									X	X	X	X	X		

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This specification consists of page 1 to 17 inclusive.

APPROVALS	NASA/MSC	60 pr 67 MIT/IL 3/17/67	ACSP

1. SCOPE

1.1 PURPOSE. This specification establishes the test requirements for repaired GFP Guidance and Navigation Systems (Block II), hereafter called the G&N System, which have been returned for repair or replacement of nonconforming subassemblies and assemblies.

1.2 DEVIATIONS. Deviations from the requirements of this specification are permitted without waivers only as specified in the Apollo Repair Retest Order (ARRO) and as authorized by NASA/RASPO.

2. APPLICABLE DOCUMENTS

2.1 EFFECTIVE DOCUMENTS. The following documents form a part of this specification to the extent specified herein.

SPECIFICATION

APOLLO G&N

ND1002214	General Specification for Preservation, Packaging, Packing and Container Marking of APOLLO Guidance and Navigation Major Assemblies, Assemblies, Subassemblies, Parts and Associated Ground Support Equipment
PS2015000	Master End Item Detail Specification Part II, Product Configuration and Acceptance Test Requirements, PGNCS Spacecraft Equipment, Block II

DRAWINGS

APOLLO G&N

2003100	Computer Assembly
2003985	AGC DSKY Assembly
2007200	Power and Servo Assembly
2007201	PIPA Electronics Assembly
2007222	Coupling Data Unit Assembly
2011000	Optics Unit Assembly
2014578	G&N Indicator Control Panel Assembly
2014641	G&N Interconnect Harness "A"

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the G&N System shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by ARRO.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the G&N System shall be subjected to all testing specified under 4.4.

4.3 MINIMUM RETEST. The G&N System shall be subjected to the selected testing under 4.4 which is applicable to the assembly repaired or replaced only when Minimum Retest is specified by the ARRO. In those instances where "applicable portions" of a JDC are specified, the entire JDC need not be performed. Only those steps which pertain to the repaired unit (and associated set-up and procedural steps) are necessary. When reverting to subsystem testing, it is necessary that the appropriate subsystem tests shall be performed first, then followed by the JDC's specified in the Block II G&N test configuration.

4.4 TESTING

4.4.1 Power and Servo Assembly (PSA). Retest for the PSA shall be specified in Table I.

4.4.2 Inertial Measurement Unit (IMU). Retest for the IMU shall be as follows: Revert to Inertial Subsystem testing and perform JDC's in Table II as applicable.

4.4.3 Command Module Computer Assembly (CMC). Retest for the Command Module Computer shall be as specified in Table III.

4.4.4 Coupling Data Unit (CDU). Retest for the CDU shall be as specified in Table IV.

4.4.5 PIPA Electronics Assembly (PEA). Retest for the PEA shall be as follows: Revert to ISS testing and perform JDC's in Table V as applicable.

4.4.6 Main Panel DSKY. Retest for the Main DSKY shall be in accordance with the tests specified in Table VI.

4.4.7 Nav DSKY. Retest for the Nav DSKY shall be in accordance with the tests specified in Table VII.

4.4.8 Indicator Control Panel (GNIC). Retest for the GNIC shall be in accordance with the tests specified in Table VIII.

4.4.9 Optics Unit Assembly (OUA). Retest for the OUA shall be in accordance with the tests specified in Table IX.

4.4.10 Nav Base (NB). Retest for the NB shall be in accordance with the tests specified in Table X.

4.4.11 Harness Group. Minimum Retest for the harness assemblies shall be as specified in Table XI.

5. PREPARATION FOR DELIVERY

5.1 GENERAL. Preparation for delivery shall be in accordance with Specification ND1002214.

6. NOTES

6.1 INSTALLATION JDC'S. - Installation JDC's shall be performed when applicable.

6.2 JDC'S. - The following JDC numbers and titles are included for reference:

JDC	TITLE
12200	G&N System Visual Inspection
12201	Assembly and Preparation of G&N System for Testing
12202	Prepare GSE for G&N System Acceptance Testing
12203	Ground Support Equipment Turn On
12204	General Turnon and Turnoff Procedures for the G&N System
12205	Standby Control Test ✓
12206	G&N System Operational Test
12207	Operate Control Test
12208	G&N System Power Supplies Test
12209	CGC Output Test
12210	CGC Input Test ✓
12211	Optics Coordinate Transformation Control Test
12212	Zero Optics Test
12213	Optics Slew Rate Test
12214	Optics Positional Accuracy Test
12215	Master Initialization
12216	Semi Automatic Mode Test
12217	IMU Performance Test
12218	G&N Fine Align Test
12219	IRIG Scale Factor Test
12220	Gimbal Response Test
12221	Spacecraft Display and Control Test
12222	Gyro Compassing
12223	Alignment of G&N System Optical Targets
12299	Post Test Performance of IMU for Shipment

TABLES I THROUGH XI

COMPONENT	MODULE	SUBSYSTEM TEST	JDC 12202	JDC 12205	JDC 12206	JDC 12207	JDC 12208	JDC 12209	JDC 12210	JDC 12211	JDC 12212	JDC 12213	JDC 12214	JDC 12216	JDC 12217	JDC 12218	JDC 12219	JDC 12220	JDC 12221	JDC 12222
TABLE I																				
PSA 2007200			X	X	X	X	X			X	X	X	X	X	X	X	X	X		X
	GYRO DC DIFF AMP & PVR 2007101															X	X	X		
	GYRO CAL. MODULE 2007102															X	X	X		
	GYRO B1 CRT SWITCH 2007103															X	X			
	PULSE TORQUE PWR SUPPLY 2007166					X	X								X	X	X			X
	-28 VDC PWR SUPPLY 2007107						X								X	X	X	X		
	3200 CPS 1% AMP 2007108			X			X							X	X	X	X	X		
	3200 CPS AAC FILTER & MULTI-VIBRATOR 2007109			X			X							X	X	X	X	X		
	800 CPS 1% AMP ISS 2007110				X		X							X						
	800 CPS 1% AMP OSS 2007110						X			X	X	X	X							
	800 CPS 5% AMP PH. A ISS 2007111				X		X							X						
	800 CPS 5% AMP PH. B ISS 2007111				X		X							X						
	800 CPS 5% AMP OSS 2007111						X			X	X	X								
	800 CPS AAC FILTER & MULTI-VIBRATOR ISS 2007112				X		X							X						
	800 CPS AAC FILTER & MULTI-VIBRATOR OSS 2007112						X			X	X	X								
	ISS STANDBY FILTER 2007113			X			X													

TABLES I THROUGH XI

TABLE I (Continued)

COMPONENT	MODULE	SUBSYSTEM TEST	JDC 12202	JDC 12205	JDC 12206	JDC 12207	JDC 12208	JDC 12209	JDC 12210	JDC 12211	JDC 12212	JDC 12213	JDC 12214	JDC 12216	JDC 12217	JDC 12218	JDC 12219	JDC 12220	JDC 12221	JDC 12222
	ISS OPERATE FILTFR 2007113					X	X													
	OSS OPERATE FILTER 2007113					X	X													
	X SERVO AMP 2007114				X	X												X		
	Y SERVO AMP 2007114				X	X												X		
	Z SERVO AMP 2007114				X	X												X		
	IMU AUX 2007117					X														
	SXT TRUN. MDA 2007118										X	X		X						
	SXT SHAFT MDA 2007118										X	X		X						
	SCT TRUN MDA 2007118										X	X								
	SCT TRUN MDA 2007118										X	X								
	OPTICS LOAD COMP 2007120										X	X	X							
	TWO SPEED SWITCH 2007121										X		X							
	COSECANT GEN. 2007122									X										
	RELAY OSS 2007123									X	X	X		X						
	RELAY OSS 2007123									X	X	X		X						
	RELAY OSS 2007123									X	X	X		X						
	RELAY ISS 2007123					X								X						
	ANTI-CREEP 2007124												X							
	OPTICS AUTO OP. RELAY 2007126													X						
	SCT MODING 2007128												X							
	IMU LOAD COMP 2007132				X		X							X						
	RETICLE LIGHT DIMMER 2007161									X										
	PSA HEADER 2007093		X	X	X	X	X			X	X	X	X	X	X	X	X	X		X

TABLES I THROUGH XI

TABLE II

COMPONENT	MODULE	SUBSYSTEM TEST	JDC 12202	JDC 12205	JDC 12206	JDC 12207	JDC 12208	JDC 12209	JDC 12210	JDC 12211	JDC 12212	JDC 12213	JDC 12214	JDC 12216	JDC 12217	JDC 12218	JDC 12219	JDC 12220	JDC 12221	JDC 12222
IMU 2018601		X	X	X		X								X	X	X	X	X		X
	BLOWER CONT. MODULE 2007172	X		X		X														
	BLOWER CONTROL THERMOSTAT & HEATER 2018625	X		X		X														
	TEMP. CONT. MODULE 2007064	X		X		X														
	TEMP. CONT. THERMOSTAT & HEATER 2018826	X		X		X														
	STABLE MEMBER HEATER (2 REQ'D) 2018641	X		X		X														
	SAFETY THERMOSTAT (2 REQ'D) 1001485	X		X		X														
	TEMP. ALARM MODULE 2007170	X		X		X														
	TEMP. ALARM THERMOSTAT 2018823	X		X		X														
	DUCOSYN TRANSFORMER 2007019	X			X										X	X	X			
	X PIP PREAMP. 2007060	X			X										X	X				
	Y PIP PREAMP. 2007060	X			X										X	X				
	Z PIP PREAMP. 2007060	X			X										X	X				
	THERMO. TEMP. ALARM LO 2018824	X		X		X														
	PRECISION ALIGN RESVR 2007204	X			X									X						
	X IRIG 2021500	X			X										X	X	X	X		X
	Y IRIG 2021500	X			X										X	X	X	X		X
	Z IRIG 2021500	X			X										X	X	X	X		X

TABLES I THROUGH XI

COMPONENT	MODULE	SUBSYSTEM TEST	JDC 12202	JDC 12205	JDC 12206	JDC 12207	JDC 12208	JDC 12209	JDC 12210	JDC 12211	JDC 12212	JDC 12213	JDC 12214	JDC 12216	JDC 12217	JDC 12218	JDC 12219	JDC 12220	JDC 12221	JDC 12222
TABLE II (Continued)																				
	X PIP 2018639	X			X										X	X				X
	Y PIP 2018639	X			X										X	X				X
	Z PIP 2018639	X			X										X	X				X
	IG TORQUE MOTOR 2018623	X			X													X		
	MG TORQUE MOTOR 2018623	X			X													X		
	OG TORQUE MOTOR 2018629	X			X													X		
	IG RESOLVER 2018631	X												X						
	MG RESOLVER 2018631	X												X						
	OG RESOLVER 2018631	X												X						
	SM"A" HARNESS 2018828	X	X		X									X	X	X	X	X		
	HEATER & TAPERED MOUNT 2018741	X		X		X														
	IG SLIP RINGS 2018634	X	X		X									X	X	X	X	X		
	MG SLIP RINGS 2018624	X	X		X									X	X	X	X	X		
	RSVR GYRO ERROR 2018632	X			X									X	X	X	X	X		
	BLOWER 2018644	X		X		X														
	"B" HARNESS 2018797	X	X		X									X	X	X	X	X		
	"C" HARNESS 2018798	X	X		X									X	X	X	X	X		
	OG SLIP RINGS 2018625	X	X		X									X	X	X	X	X		
TABLE III																				
Computer (CMC) 2003100			X	X	X	X	X	X	X											
	TRAY A 2003074		X	X	X	X	X	X	X											
	TRAY B 2003075		X	X	X	X	X													

TABLES I THROUGH XI

TABLE III (Continued)

COMPONENT	MODULE	SUBSYSTEM TEST	JDC 12202	JDC 12205	JDC 12206	JDC 12207	JDC 12208	JDC 12209	JDC 12210	JDC 12211	JDC 12212	JDC 12213	JDC 12214	JDC 12216	JDC 12217	JDC 12218	JDC 12219	JDC 12220	JDC 12221	JDC 12222
	INTERCONNECT HEADER 2003059		X	X	X		X	X	X											
	OSCILLATOR MODULE B-7 2003036			X	X		X													
	ALARM MODULE B-8 2003069			X	X															
	ERASEABLE DRIVER MODULE B9-10 2003014			X	X															
	ERASEABLE DRIVER MODULE B9-10 2003014			X	X															
	CURRENT SWITCH MODULE B-11 2003026			X	X															
	ERASEABLE MEMORY MODULE B-12 2003011			X	X															
	SENSE AMPLIFIER B-13-14 2003043			X	X															
	SENSE AMPLIFIER B-13-14 2003043			X	X															
	STRAND SELECT B-15 2003027			X	X															
	ROPE DRIVER B16-17 2003040			X	X															
	ROPE DRIVER B16-16 2003040			X	X															
	LOGIC MODULE A1 2003020			X	X															
	LOGIC MODULE A2 2003020			X	X															
	LOGIC MODULE A3 2003020			X	X															
	LOGIC MODULE A4 2003020			X	X															
	LOGIC MODULE A5 2003020			X	X															
	LOGIC MODULE A6 2003020			X	X															
	LOGIC MODULE A7 2003020			X	X															
	LOGIC MODULE A8-11 2003020			X	X															
	LOGIC MODULE A8-11 2003020			X	X															
	LOGIC MODULE A8-11 2003020			X	X															

TABLES I THROUGH XI

TABLE III (Continued)

COMPONENT	MODULE	SUBSYSTEM TEST	JDC 12202	JDC 12205	JDC 12206	JDC 12207	JDC 12208	JDC 12209	JDC 12210	JDC 12211	JDC 12212	JDC 12213	JDC 12214	JDC 12216	JDC 12217	JDC 12218	JDC 12219	JDC 12220	JDC 12221	JDC 12222
	LOGIC MODULE A12 2003020			X	X															
	LOGIC MODULE A13 2003020			X	X															
	LOGIC MODULE A14 2003020			X	X															
	LOGIC MODULE A15 2003020			X	X															
	LOGIC MODULE A16 2003020			X	X															
	LOGIC MODULE A17 2003020			X	X															
	LOGIC MODULE A18 2003020			X	X															
	LOGIC MODULE A19 2003020			X	X															
	LOGIC MODULE A20 2003020			X	X															
	LOGIC MODULE A21 2003020			X	X															
	LOGIC MODULE A22 2003020			X	X															
	LOGIC MODULE A23 2003020			X	X															
	LOGIC MODULE A24 2003020			X	X															
	POWER SUPPLY A-30-31 2003056			X	X		X													
	POWER SUPPLY A30-30 2003056			X	X		X													
	INTERFACE MODULE A25-26 2003070				X			X	X											X
	INTERFACE MODULE A25-26 2003070				X			X	X											X
	INTERFACE MODULE A27-29 2003067				X			X	X											X
	INTERFACE MODULE A27-29 2003067				X			X	X											X
	INTERFACE MODULE A27-29 2003067				X			X	X											X
	CORE ROPES B1-6				X															

TABLES I THROUGH XI

COMPONENT	MODULE	SUBSYSTEM TEST	JDC 12202	JDC 12205	JDC 12206	JDC 12207	JDC 12208	JDC 12209	JDC 12210	JDC 12211	JDC 12212	JDC 12213	JDC 12214	JDC 12216	JDC 12217	JDC 12218	JDC 12219	JDC 12220	JDC 12221	JDC 12222
		TABLE IV																		
CDU 2007222			X			X				X	X	X	X	X	X	X			X	
	IG COARSE SYSTEM 2007236					X								X						
	MG COARSE SYSTEM 2007236					X								X						
	OG COARSE SYSTEM 2007236					X								X						
	DIGITAL MODE MODULE 2007141					X				X	X	X	X	X						
	IG D/A CONVERTER 2007237													X						
	MG D/A CONVERTER 2007237													X						
	OG D/A CONVERTER 2007237													X						
	TRUN D/A CONVERTER 2007237													X					X	
	SHAFT D/A CONVERTER 2007237													X					X	
	IG ERR. ANG. COUNTER & LOGIC 2007139					X								X	X	X				
	MG ERR. ANG. COUNTER & LOGIC 2007139					X								X	X	X				
	OG ERR. ANG. COUNTER & LOGIC 2007139					X								X	X	X				
	TRUN ERR. ANG. COUNTER & LOGIC 2007139										X		X							
	SHAFT ERR. ANG. COUNTER & LOGIC 2007139										X		X							
	INTERROGATE MODULE 2007263					X					X	X	X	X						
	IG MSA & QUAD REJECT 2007238					X								X	X	X				
	MG MSA & QUAD REJECT 2007238					X								X	X	X				
	OG MSA & QUAD REJECT 2007238					X								X	X	X				
	TRUN MSA & QUAD REJECT 2007238										X		X							

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COMPONENT	MODULE	SUBSYSTEM TEST	JDC 12202	JDC 12205	JDC 12206	JDC 12207	JDC 12208	JDC 12209	JDC 12210	JDC 12211	JDC 12212	JDC 12213	JDC 12214	JDC 12216	JDC 12217	JDC 12218	JDC 12219	JDC 12220	JDC 12221	JDC 12222
TABLE IV (Continued)																				
	SHAFT MSA & QUAD REJECT 2007238										X		X							
	MODE MODULE 2007254					X							X	X						
	POWER SUPPLY 2007142						X													
	IG QUADRANT SELECT 2007243					X								X	X	X				
	MG QUADRANT SELECT 2007243					X								X	X	X				
	OG QUADRANT SELECT 2007243					X								X	X	X				
	TRUN. QUADRANT SELECT 2007243									X			X							
	SHAFT QUADRANT SELECT 2007243									X			X							
	IG READ COUNTER 2007140					X								X	X	X				
	MG READ COUNTER 2007140					X								X	X	X				
	OG READ COUNTER 2007140					X								X	X	X				
	TRUN. READ COUNTER 2007140										X		X							
	SHAFT READ COUNTER 2007140									X	X	X	X							
	TRAY S 2007091		X			X								X	X	X				
	TRAY X 2007090		X			X	X						X	X						
TABLE V																				
PEA 2007201		X	X				X								X	X				
	X DC AMP & PVR 2007101	X					X								X					
	Y DC AMP & PVR 2007101	X					X								X					
	Z DC AMP & PVR 2007101	X					X								X					
	X Bl. CRT. SWITCH 2007103	X													X					
	Y Bl. CRT. SWITCH 2007103	X													X					
	Z Bl. CRT. SWITCH 2007103	X													X					
	X AC DIFF. AMP & INT. 2007104	X													X					
	Y AC DIFF. AMP & INT. 2007104	X													X					
	Z AC DIFF. AMP & INT. 2007104	X													X					

TABLES I THROUGH XI

COMPONENT	MODULE	SUBSYSTEM TEST	JDC 12202	JDC 12205	JDC 12206	JDC 12207	JDC 12208	JDC 12209	JDC 12210	JDC 12211	JDC 12212	JDC 12213	JDC 12214	JDC 12216	JDC 12217	JDC 12218	JDC 12219	JDC 12220	JDC 12221	JDC 12222
TABLE V (Continued)																				
	X PIPA CAL. 2007105	X													X	X				
	Y PIPA CAL. 2007105	X													X	X				
	Z PIPA CAL. 2007105	X													X	X				
	PEA HEADER	X	X				X								X	X				
TABLE VI																				
MAIN PANEL DSKY 2003985			X		X															
	ALARM INDICATOR 1006316			X	X															
	DIGITAL INDICATOR 1006315			X	X															
	INDICATOR DRIVER D1-6 2003902			X	X															
	INDICATOR DRIVER D1-6 2003902			X	X															
	INDICATOR DRIVER D1-6 2003902			X	X															
	INDICATOR DRIVER D1-6 2003902			X	X															
	INDICATOR DRIVER D1-6 2003902			X	X															
	POWER SUPPLY D7 2003901			X	X															
	KEYBOARD D8 2003909			X	X															
	WIRING HARNESS 2003980		X		X															
TABLE VII																				
NAV BASE DSKY 2003985			X		X															
	ALARM INDICATOR 1006316			X	X															
	DIGITAL INDICATOR 1003615			X	X															
	INDICATOR DRIVER B1-6 2003902			X	X															
	INDICATOR DRIVER B1-6 2003902			X	X															
	INDICATOR DRIVER B1-6 2003902			X	X															

TABLES I THROUGH XI

TABLE VII(Continued)

COMPONENT	MODULE	SUBSYSTEM TEST	JDC 12202	JDC 12205	JDC 12206	JDC 12207	JDC 12208	JDC 12209	JDC 12210	JDC 12211	JDC 12212	JDC 12213	JDC 12214	JDC 12216	JDC 12217	JDC 12218	JDC 12219	JDC 12220	JDC 12221	JDC 12222
	INDICATOR DRIVER B1-6 2003902			X	X															
	INDICATOR DRIVER B1-6 2003902			X	X															
	INDICATOR DRIVER B1-6 2003902			X	X															
	POWER SUPPLY D7 2003901			X	X															
	KEYBOARD D-8 2003909			X	X															
	WIRING HARNESS 2003980		X		X															

TABLE VIII

COMPONENT	MODULE	SUBSYSTEM TEST	JDC 12202	JDC 12205	JDC 12206	JDC 12207	JDC 12208	JDC 12209	JDC 12210	JDC 12211	JDC 12212	JDC 12213	JDC 12214	JDC 12216	JDC 12217	JDC 12218	JDC 12219	JDC 12220	JDC 12221	JDC 12222
INDICATOR CONTROL PANEL 2014578			X		X	X			X	X	X	X	X	X		X				
	CONDITION ANNUNCIATOR 1010949				X															
	MASTER ALARM ANNUNCIATOR					X														
	RETICLE BRIGHTNESS LAMP 1010999									X										
	7 ELECTROLUMINESCENT LAMPS 1010999					X														
	SLAVE TO SXT SWITCH 1010902												X							
	TRACKER SWITCH 1010902									X										
	OPTICS SPEED SWITCH 1010902											X								
	CONDITION LAMPS SWITCH 1010903					X														
	OPTICS MODE SWITCH 1010903										X			X						
	SXT HAND CONTROLLER 2014550									X			X							
	MARK REJECT SWITCH 1010904															X				
	MARK SWITCH 1010904															X				
	TELEMETRY SWITCH 1010905								X											
	DIRECT-RESOLVE SWITCH 1010905									X										
	ATTITUDE IMPULSE SWITCH 2014700								X											
	TRANSFORMER 1010942									X			X							

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COMPONENT	MODULE	SUBSYSTEM TEST	JDC 12202	JDC 12205	JDC 12206	JDC 12207	JDC 12208	JDC 12209	JDC 12210	JDC 12211	JDC 12212	JDC 12213	JDC 12214	JDC 12216	JDC 12217	JDC 12218	JDC 12219	JDC 12220	JDC 12221	JDC 12222
TABLE VIII (Continued)																				
	STAR ACQ. LAMP 1010268																			
	HARNESS 2014622		X		X	X			X	X	X	X	X	X		X				
	RETICLE BRIGHTNESS CONTROL 2014656									X										
TABLE IX																				
OPTICAL UNIT 2011000		OSS								X	X	X	X							
TABLE X																				
NAVIGATION BASE 2899982																X				
TABLE XI HARNESS GROUP																				
	"A" HARNESS 2014641		X	X	X	X	X	X	X					X	X	X	X	X	X	X
	"B" HARNESS 2014642		X				X			X	X	X	X							
	"C" HARNESS 2014643		X	X	X	X	X							X	X	X	X	X	X	X
	"D" HARNESS 2014644		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	
	"E" HARNESS 2014645		X			X		X	X	X	X	X	X			X				
	"F" HARNESS 2014646		X							X	X	X	X							
	"G" HARNESS 2014647		X	X	X	X	X				X	X	X	X	X	X	X	X	X	
	"H" HARNESS 2014648		X	X	X	X	X	X	X											

APOLLO G&N Specification
ND1002353 REV -
Original Issue Date: 14 APR 67
Release Authority: TDRR 33614
Class A Release
CODE IDENT NO. 80230

GFP RETEST SPECIFICATION

FOR

GUIDANCE AND NAVIGATION SYSTEMS

(LEM)

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				MIT	NASA

This specification consists of page 1 to 24 inclusive.

APPROVALS	NASA/MSC	6 Apr 67 MIT/IL 3/27/67	T.A. Stoner ACSP

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TABLE II (Continued)

COMPONENT	MODULE	Subsystem Test	JDC 12608	JDC 12615	JDC 12616	JDC 12617	JDC 12618	JDC 12619	JDC 12621	JDC 12622	JDC 12623	JDC 12624	JDC 12625	JDC 12626	JDC 12627
	OG SLIP RINGS 2018625	X				X		X			X	X	X		X
	RSVR GYRO ERROR 2018632	X				X		X				X	X		X
	BLOWER 2018644	X		X	X										
	"B"HARNESS 2018797	X	X					X			X	X	X		X
	"C"HARNESS 2018798	X	X					X			X	X	X		X

TABLE III

COMPONENT	MODULE	Subsystem Test	JDC 12608	JDC 12615	JDC 12616	JDC 12617	JDC 12618	JDC 12619	JDC 12621	JDC 12622	JDC 12623	JDC 12624	JDC 12625	JDC 12626	JDC 12627
LGC 2003100			X	X	X	X	X		X	X					
	TRAY A 2003074		X	X	X	X	X		X	X					
	TRAY B 2003075		X	X	X	X	X								
	INTERCONNECT HEADER 2003059		X	X	X	X	X		X	X					
	OSCILLATOR MODULE B7 2003036			X	X	X									
	ALARM MODULE B8 2003069					X									
	ERASABLE DRIVER MODULE B9-10 2003014					X									

APOLLO G&N Specification
ND1002357 REV A
Original Issue Date: 4 MAY 67
Release Authority: TDRR 33707
Class A Release

PROCESS SPECIFICATION
FOR
STRAIGHTENING OF BENT CONNECTOR CONTACTS

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals AC	Approvals NASA
8/21/68	A	36737	2	MGM EA	- -

This specification consists of page 1 to 6 inclusive.

APPROVALS	NASA/MSC	2 May 67 MIT/IL	CGA	RA Kallio V A. Olson EDG ACSP

1. SCOPE

1.1 PURPOSE. This specification establishes the limitations for straightening bent connector contacts. The limits specified herein have been established by evaluation tests and any contacts which exceed these limits may not be reworked in accordance with this specification.

2. APPLICABLE DOCUMENTS

2.1 EFFECTIVE ISSUES. The following documents form a part of this specification to the extent specified herein.

SPECIFICATIONS

APOLLO G&N

ND1002136	Specification for Assembly of Electrical Wrapost Contacts and Insulators

DRAWINGS

APOLLO G&N

1006348	Connector, Receptacle, Electrical, Hermetic Seal
1006361	Connector, Receptacle, Electrical, Hermetic Seal
1006781	Contact, Wrapost, Female Miniature
1006782	Contact, Wrapost, Male Miniature
1008954	Silicone Compound
1010382	Contact, Blade, Edge Connector
*1010770	Contact, Crimp Type No. 22 Size, Pin and Socket
1010783	Connector, Receptacle, Electrical, Hermetic Seal
1010936	Connector, Receptacle, Electrical, Hermetic Seal
1010956	Contact, Electrical Miniature, Male Crimp Type
1010994	Contact, Wire Wrap, Double Ended
1012151	Connector, Receptacle, Electrical, Hermetic Seal

APOLLO G&N Specification
ND1002357 REV –
Original Issue Date: 4 MAY 67
Release Authority: TDRR 33707
Class A **Release**

PROCESS SPECIFICATION
FOR
STRAIGHTENING OF BENT CONNECTOR CONTACTS

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				AC	NASA

This specification consists of page 1 to 6 inclusive.

APPROVALS	NASA/MSC	2 May 67 MIT/IL	CCB	R A Kallio V A. Olson Weatherford EDG AC

1. SCOPE

1.1 PURPOSE. This specification establishes the limitations for straightening bent connector contacts. The limits specified herein have been established by evaluation tests and any contacts which exceed these limits may not be reworked in accordance with this specification.

2. APPLICABLE DOCUMENTS

2.1 EFFECTIVE ISSUES. The following documents form a part of this specification to the extent specified herein.

SPECIFICATIONS

Military

MIL-S-8660	Silicone Compound (DC-4)

APOLLO G&N

ND1002136	Specification for Assembly of Electrical Wrapost Contacts and Insulators

DRAWINGS

APOLLO G&N

1006348	Connector, Receptacle, Electrical, Hermetic Seal
1006361	Connector, Receptacle, Electrical, Hermetic Seal
1006781	Contact, Wrapost, Female Miniature
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*1010770	Contact, Crimp Type No. 22 Size, Pin and Socket
1010783	Connector, Receptacle, Electrical, Hermetic Seal
1010936	Connector, Receptacle, Electrical, Hermetic Seal
1010955	Contact, Electrical Miniature, Male Crimp Type
1010994	Contact, Wire Wrap, Double Ended
1012151	Connector, Receptacle, Electrical, Hermetic Seal

3. REQUIREMENTS

3.1 GENERAL. The requirements of this specification shall be applicable only to the contacts specified herein. Any other contact configuration or utilization of base materials will require a special evaluation to establish bend characteristics of the part prior to straightening the contact.

3.2 PREREQUISITE TO STRAIGHTENING CONTACTS. Prior to determining the feasibility of straightening a specific contact, the following criteria must be established and documented.

3.2.1 Part Type. Identify by part number (including dash number) and name of manufacturer.

3.2.2 Circuit Point Identification. The specific contact or contacts affected will be identified by assembly identification number and contact number.

3.2.3 Degree of Bend. Determine the degree of bend. Optical gages and tools may be used to determine the amount of bend from true centerline of contact. A terminal shall be designated as a "Bent Contact" if misalignment is such that normal engagement of mating assemblies is not possible without risk of causing additional damage such as; damage to socket contact, further bending of pin contact, fracturing of contact or recessing of contact.

3.2.4 History. Establish past history of the contact to determine if the contact has been previously bent and straightened.

3.2.5 Need for Straightening. Establish need for straightening. During initial assembly when contacts are readily accessible, any bent contacts shall be replaced.

3.3 STRAIGHTENING CRITERIA

3.3.1 Female Contact Wrapost (P/N 1006781). The contact cannot be straightened. Any attempt to straighten the contact will result in permanent damage. After installation in nylon insulator, the wrapost tip may be flexed a maximum of 0.125 inch from true position to facilitate realignment in the installed position. Flexing of the wrapost in excess of 0.125 inch will cause catastrophic failure or fracturing of wrapost.

3.3.2 Male Contact Wrapost (P/N 1006782). The contact may be straightened twice provided the contact has not been bent in excess of 10°. The contact may be straightened once when bent in excess of 10° but not more than 30°.

3.3.3 Male Contact Wrapost (P/N 1010382). The contact may be straightened twice providing the contact has not been bent in excess of 20° . The contact may be straightened once when bent in excess of 20° but not more than 30°.

3.3.4 Male Contact, Crimp Terminal (P/N 1010955). The contact may be straightened twice provided the contact has not been bent in excess of 45°. The contact may be straightened once when bent in excess of 45° but no more than 90°.

3.3.5 Contact Wire Wrap Double Ended (P/N 1010994). The contact may be straightened twice provided the contact has not been bent in excess of 30°. The contact may be straightened once when bent in excess of 30° but no more than 45°.

3.3.6 Connector, Receptacle Electrical Hermetic Seal (P/N's 1006348, 1006361, 1010936, & 1012151). The contact may be straightened twice provided the contact has not been bent in excess of 45°. The contact may be straightened once when bent in excess of 45° but no more than 90°.

3.3.7 Pin Contacts (P/N 1010770-1). The contacts may be straightened once provided the contact has not been bent in excess of 10°. Contacts bent in excess of 10° may not be straightened.

3.3.8 Connector, Receptacle Electrical Seal (P/N 1010783). A contact may be straightened twice provided that contact has not been bent in excess of 45°. The contact may be straightened once when bent in excess of 45° but no more than 90°.

3.4 REPAIR PROCEDURE. After it has been determined that the contact has been bent beyond the acceptable equipment requirements and can be straightened within the limits of this specification, a suitable tool will be used which will not further degrade the contact by denting or scratching the plated surfaces. The bent contact may be straightened with a specially designed tool, an adapted plastic tool or a mating socket contact where feasible. After the contact has been straightened, coat the contact surface in the vicinity where the bending occurred with a thin film of DC-4 compound applied with a brush. Remove all surplus DC-4 compound. The DC-4 compound shall be used only on the bent and straightened exposed sections of mating type contacts.

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. In order to assure proper control of straightening of contacts to the limitations specified herein, the contractor shall be responsible for documenting the straightening of each contact and the document shall become a part of the data package of the unit.

4.1.1 Inspection. The contractor, through his quality assurance or control agency shall be responsible for the performance of all inspection requirements to assure that the straightened contacts meet the alignment, retention, and visual requirements of the control documents. In the case of mating contacts, should a compound bend result from the straightening action, this will be grounds for rejection of the repair and no further straightening of the contact will be permitted.

5. PREPARATION FOR DELIVERY. This section is not applicable to this specification.

6. NOTES. None.

WS:jls

APOLLO G & N Specification
ND 1002359 Rev. ~~A~~ B
Original Issue Date: 3 AUG '67
Release Authority: TDRR
Class A Release 34253

PROCESS SPECIFICATION

SPECIAL CONDITIONING OF NOR GATES

(FLAT PACKS)

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				~~MIT~~ CCB	NASA
① 3 AUG 67	A	34253	Initial Release		—
② 9/9/68	B	36811	1,4,8,10,12,18,19	FG	FE

This specification consists of pages 1 to 19 inclusive

APPROVALS	NASA/MSC	MIT/IL	RAY
	A C	E C Hall 3/17/67 6/9/67 9 June 67	3 Aug 67

f. Centrifuge Y_1 test (test #6).

g. Continuity open and short test (test #7).

h. Centrifuge Y_2 test (test #8).

i. Electrical test (test #9).

j. Propagation delay (test #10).

k. Emitter base back bias (test #11).

l. DC Current Gain Measurement (Test #12).

m. Helium Leak test (Test #13).

n. Gross Leak Test (Test #14).

o. Operation life test (test #15).

p. Electrical test (Test #16).

q. Vibration test (test #17).

r. Shock test (test #18).

s. Continuity test (test #19).

t. Internal visual inspection (test #20).

u. X-Ray Inspection (test #21) optional.

A flow diagram of the above sequence is attached.

3.3.1.1 Removal of Failures

Catastrophic failures only shall be removed from the test sequence at the point of detection and subjected to failure analysis. The point in the test sequence 3.3.1 where the failure was detected must be recorded and a set of electrical reading as specified in paragraph 3.3.2.3 shall be performed. All electrical failures at the end of the test sequence 3.3.1 shall be subjected to failure analysis except the failures as defined in 6.2.3 (a), (b), & (d) may be returned to the vendor;

3.3.2 Tests

3.3.2.1 External Visual Inspection (Test #1)

Each lot of Nor gates shall be subjected to an external visual inspection in accordance with MIL-STD-750, method 2071 and the applicable Specification Control Drawing 1006321 or 1006394 with additional requirements to be negotiated with the vendor, and to be included in the purchase order.

3.3.2.16 Vibration Test (Test #17)

The vibration test shall be performed on random sample of 77 units.* The vibration test shall be performed in accordance with MIL-STD-750, Method 2056, 30g's from 5 to 2000 cps limited to 0.12 inch double amplitude, 3 cycles, 15 minutes per cycle minimum.

3.3.2.17 Shock Test (Test #18)

The shock test shall be performed on the same units tested in 3.3.2.16. The shock test shall be performed in accordance with MIL-STD-750, Method 2016, 1500 g's, 0.5 m sec 5 blows in all axis directions, 30 blows total.

3.3.2.18 Internal Visual Inspection (Test #20)

The internal visual inspection shall be performed on the 82 units from test 3.3.2.17 and 3.3.2.3 and in accordance with ND 1002257. If X-Ray (ref: test #21) inspection is performed on the lot, the failure modes covered by ND 1002257 which are considered screenable by X-Ray Inspection shall not apply.

3.3.2.19 X-Ray Inspection (Optional)

After the completion of third electrical test (#16), all devices remaining in the lot will be subjected to an X-Ray Inspection, for inclosed conductive particles, shorts due to bent internal lead wires, and any other condition considered by the inspector, to be abnormal. The X-ray photographs used in this inspection will be taken perpendicular ($\pm 15^{\circ}$) to the plane of the lid of the flat pack.

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL

In order to assure proper control of the acceptance process covered by this specification, the contractor shall meet all the requirements specified herein and shall provide continuous audit of the acceptance process to assure compliance with the requirements of this specification.

4.1.1 Inspection

The contractor, through his quality assurance or control agency shall be responsible for the performance of all inspection requirements and tests specified herein.

4.2 FAILURE CRITERIA

4.2.1 Failure Analysis

All Nor gates or Nor gate expanders failing in the electrical tests specified in 3.3.2 (test #3, 7, 9, 12, and 16) except the non-catastrophic failures as defined in 6.2.3 (a,b, & d), shall be subjected to a failure analysis sufficient to identify cause and mode of failure. For failure definitions refer to Section 6.2.

* When samples are selected for tests #10, #11, & 17, the samples shall be representative of all diffusion sub-lots in the shipment lot.

4.2.2 Failure Modes (Cont'd)

b. Class B failure modes (Class B failure modes are of a type less readily detected during screen and burn-in as compared with Class A).

1. Shorts resulting from leads touching any other leads and shorts resulting from leads touching metal interconnects.
2. Opens in the interconnect due to the gold-aluminum eutectic formation at the neck of an interconnect.
3. Shorts through the silicon dioxide due to poor oxide dielectric strength.
4. Shorts through the oxide because the bonds are too close to the chip edge.
5. Shorts, intermittent or otherwise, due to particles in the package.
6. Shorts, intermittent or otherwise, due to free lead material and fixed extra leads or lead material.
7. Catastrophic failures due to surface instabilities.
8. Opens in interconnect at oxide steps detected during test 3.3.2.3.

NOTE: If X-Ray inspection is performed on the entire lot (ref para 3.3.2.19), any failure mode considered screenable by X-Ray inspection will be considered a Class A failure mode.

c. Class C failure modes (Class C failure modes are of a type which are time dependent and/or are not easily detected during screen and burn-in).

1. Opens in the interconnect due to corrosion.
2. Opens in the interconnect detected after test 3.3.2.3 at oxide steps.
3. Opens in the interconnect detected after test 3.3.2.3 at scratches.
4. Any failures due to electrically insulating or electrically high resistance layers forming at the silicon oxide window between the metal contact and the silicon or between the layers of metal.
5. Die separated from package header.

d. Group III — Class C failure modes.

e. Group IV — Any failure, except induced failures, not listed in Section 4.3.2 or any failure for an unknown cause.

TABLE I

Test Number (See Para.3.3.1)	*Maximum Percent of Failures				
	Group 0	Group I	Group II	Group III	Group IV
3	0.5%	0.3%	0.08%	0.04%	0%
7,9,and 16	0.5%	0.3%	0.04%	0.02%	0%

*For shipment lots of from 4000 to 5000 units, use the same number of allowable failures as applied to lots of 5000. For smaller lots, use percentages as shown in Table I. If the number of unit failures allowable is calculated to be a mixed number, a combination of an integer and a fraction, use the integer only.

TABLE II

Test Number (See Paragraph 3.3.1	Maximum Percent of Failures or Maximum Allowable rejects
2	1 defective unit, Physical Dimensions
2	1 defective unit, Lead fatigue and tension
12	10 Units
[illegible]	[illegible]
[illegible]	[illegible]
19	1 unit
20 **	8 units

** Those failure modes covered by ND 1002257 which are screenable by X-Ray inspection shall not apply to the maximum allowable rejects when the X-Ray inspection option (REF: Test #21) is performed on the lot.

6.2.11 Internal Visual Inspection Failures

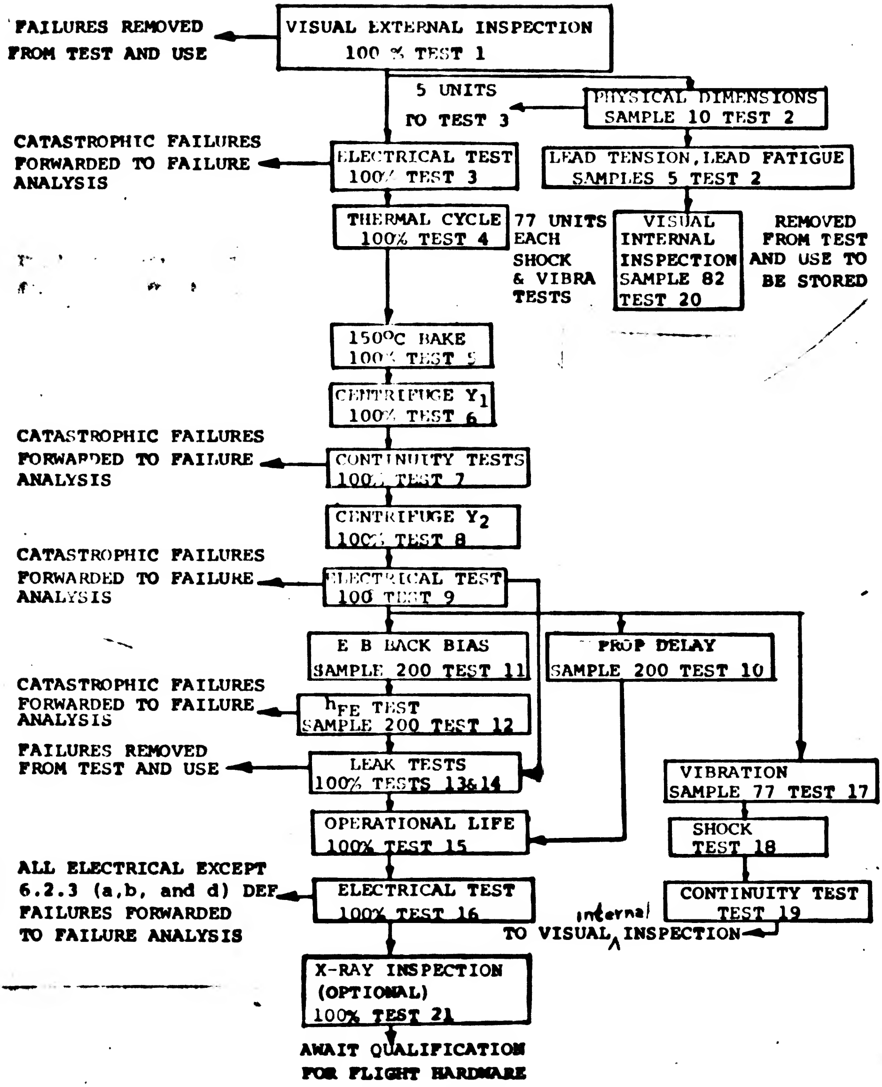
A Failure at test #20 of paragraph 3.3.1 is a failure to meet the criteria of ND 1002257. (Where the X-Ray inspection option is used, the failure modes covered by ND 1002257 which are considered screenable by X-Ray inspection shall not apply)

6.2.12 Continuity Failure

A failure of the continuity test is the detection of an open or a short.

6.2.13 X-Ray Inspection (Optional)

If X-Ray inspection is performed (test #21), any device which shows evidence of enclosed conductive particles, shorts due to bent internal lead wires, or other abnormal conditions will be considered a reject.


FAILURES REMOVED FROM TEST AND USE
VISUAL EXTERNAL INSPECTION 100 % TEST 1
5 UNITS TO TEST 3
PHYSICAL DIMENSIONS SAMPLE 10 TEST 2
CATASTROPHIC FAILURES FORWARDED TO FAILURE ANALYSIS
ELECTRICAL TEST 100% TEST 3
LEAD TENSION, LEAD FATIGUE SAMPLES 5 TEST 2
THERMAL CYCLE 100% TEST 4
77 UNITS EACH SHOCK & VIBRA TESTS
VISUAL INTERNAL INSPECTION SAMPLE 82 TEST 20
REMOVED FROM TEST AND USE TO BE STORED
150°C BAKE 100% TEST 5
CENTRIFUGE Y1 100% TEST 6
CATASTROPHIC FAILURES FORWARDED TO FAILURE ANALYSIS
CONTINUITY TESTS 100% TEST 7
CENTRIFUGE Y2 100% TEST 8
CATASTROPHIC FAILURES FORWARDED TO FAILURE ANALYSIS
ELECTRICAL TEST 100 TEST 9
E B BACK BIAS SAMPLE 200 TEST 11
PROP DELAY SAMPLE 200 TEST 10
CATASTROPHIC FAILURES FORWARDED TO FAILURE ANALYSIS
hFE TEST SAMPLE 200 TEST 12
FAILURES REMOVED FROM TEST AND USE
LEAK TESTS 100% TESTS 13&14
VIBRATION SAMPLE 77 TEST 17
OPERATIONAL LIFE 100% TEST 15
SHOCK TEST 18
ALL ELECTRICAL EXCEPT 6.2.3 (a,b, and d) DEF. FAILURES FORWARDED TO FAILURE ANALYSIS
ELECTRICAL TEST 100% TEST 16
CONTINUITY TEST TEST 19
TO VISUAL internal INSPECTION
X-RAY INSPECTION (OPTIONAL) 100% TEST 21
AWAIT QUALIFICATION FOR FLIGHT HARDWARE

FLOW DIAGRAM FOR THE TEST SEQUENCE 3.3.1

APOLLO G&N Specification
ND1002360 REV — A
Original Issue Date: 2 MAR 67
Release Authority: TDRR 33143
Class A Release
CODE IDENT NO. 80230

GFP RETEST SPECIFICATION

FOR

INERTIAL MEASURING UNIT ASSEMBLIES

(BLOCK II & LEM)

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				AC	NASA
5/4/67	A	33713	4, 6-11	MGM EA	--

This specification consists of page 1 to 11 inclusive.

APPROVALS	NASA/MSC	Robt Crisp 2.24.67	MIT/IL	CCA	R. Temple 3-2-67 AC	

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the IMU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the IMU shall be subjected to all testing specified in 4.3 of the applicable procurement specification, PS2016154 (Block II), PS2018601 (Block II or LEM), or PS2016152 (LEM).

4.3 MINIMUM RETEST. The IMU shall be subjected to the applicable test(s) listed in either Table I(Block II), Table II (Block II or LEM), or Table III (LEM). Whenever the IMU is opened for inspection or component retest, the following tests shall be performed subsequent to the inspection or component retest in order to insure optimum IMU performance.

a. Resistance per 4.3.4 of the applicable procurement specification
b. Insulation Resistance per 4.3.16 of the applicable procurement specification
c. Gimbal Torque per 4.3.12 of the applicable procurement specification
d. Phasing tests as applicable, subsequent to component level retest.

5. PREPARATION FOR DELIVERY

5.1 GENERAL. Preparation for delivery shall be in accordance with Specification ND1002214.

6. NOTES

6.1 PRODUCT PERFORMANCE AND CONFIGURATION REQUIREMENTS/QUALITY VERIFICATION CROSS REFERENCE INDEX (per the applicable specification, PS2016154, PS2018601 or PS2016152).

Test/Examination	Requirement	Method
Heat Exchanger Leak Rate	3.1.2.1	4.3.2
Heat Exchanger Pressure Drop	3.1.2.2	4.3.3
PIPA Temperature	3.1.2.3	4.3.5.5
IRIG Temperature	3.1.2.4	4.3.5.5
Temperature Alarm Limits	3.1.2.7	4.3.5.1
Blower Operation	3.1.2.8	4.3.5.2
Torque Motor Phasing	3.1.2.12	4.3.6
1X and 16X Resolver Phasing	3.1.2.13	4.3.7
Precision Resolver Alignment Module	3.1.2.14	4.3.8
PIP Phasing	3.1.2.15	4.3.9
IRIG and Gyro Error Resolver Phasing	3.1.2.16	4.3.10
Balance	3.1.2.17	4.3.11
Gimbal Torque	3.1.2.18	4.3.12
Pressure	3.1.2.19	4.3.13
Telemetry Signal Outputs	3.1.2.20	4.3.14
PTC Interlock	3.1.2.21	4.3.15

TABLE I

TEST REQUIRED PER SPECIFICATION PS2016154 (BLOCK II)

PART REPLACED- NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1a&b	4.3.5.1.3a&b	4.3.5.2a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16
2021500 25 IRIG		2	X		0	0	0	0	0	3					X	0	0	4			0
2018844 PIP CALIB. ASSY.		2	X		0	0	0	0	0	5				X		0	0	4			0
2007060 PIP Preamp	X		X		0									X		1	0	4			0
2007064 Temp. Control Module	X		X		0	0	0			5						1	0	4			0
2018826 Temp. Control Thermo	X	2	X		0	0	0			5						1	0	4			0
2007170 Temp/ Alarm Module	X		X		0	0	0									1	0	4			0
2007172 Blower Control Module	X		X		0	0	0	0								1	0	4			0
2018825 Blower Control Thermo	X		X		0	0	0	0								1	0	4			0
2018641 Heater SM	X		X		0	0	0			5						1	0	4			0
2018741 Htr & T.M. Assy IRIG	X		X		0	0	0			5						0	0	4			0
2007019 Transformer	X		X		0					5				0	0	1	0	4			0
2007204 Precision Resolver Module	X		X		0								0				0	4			0
2018644 Blower	X		X		0			0								1	0	4	0		0
2018824 Temp Alarm Thermo Lo Limit	X		X		0	0										1	0	4			0
2018823 Temp Alarm Thermo Hi Limit	X		X		0		0									1	0	4			0

TABLE I (Continued)

PART REPLACED- NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1 a & b	4.3.5.1.3 a & b	4.3.5.2a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
2018609 I.G.S.A. T.M., O.A.			X		0					5	X					X	X	4			0	
2018610 I.G.S.A. T.M., M.A.			X		0					5	X					X	0	4			0	(See Note 6)
2018611 I.G.S.A. T.M., I.A.			X		0					5	X					0	0	4			0	
2018612 I.G.S.A. Resolver O.A.			X		0			0		5		X	0			X	X	4	0	0	0	(See Note 6)
2018613 I.G.S.A. Resolver MA			X		0					5		X				X	0	4			0	
2018614 I.G.S.A. Resolver I.A.			X		0					5		X			0	0	0	4			0	(See Note 6)
2018738 Case Mach. Assy.			X	0	0	0	0			5						0	0	0			0	
1010353 Relay	X		X					0										4	0		0	

CODE 0 - Perform requirements of complete paragraph

X - Perform requirements of the paragraph applicable to the component replaced or other component or assembly affected,

1. Weights of replacement parts shall be compared with parts removed and rebalanced only if the change will cause the unbalance to exceed the original requirements. Record calculations in history log.
2. Reselect padding resistors per 3.2.2.2 only if PIP and IRIG temperature requirements per 4.3.5.5.b at 20 percent duty cycle are not met. Do not reselect R2.
3. PIP and IRIG temperatures shall be checked per 4.3.5.5.a and per 4.3.5.5.b at 50 percent control heater duty cycle only.
4. The Pressure Test shall be performed when an IMU is repaired subsequent to Inertial Subsystem testing prior to IMU shipment.
5. PIP and IRIG temperatures shall be checked per 4.3.5.5b at 20 percent duty cycly only.
6. Use adapter cable to maintain PIP and IRIG temperatures during replacement operation.

TABLE II

TEST REQUIRED PER SPECIFICATION PS2018601 (BLOCK II & LEM)

PART REPLACED - NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1	4.3.5.1.3	4.3.5.2	4.3.5.5	4.3.6.	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
2021500 25 IRIG		2	X		0	0	0		3					X	0	0	4			0	
2018844 PIP CALIB ASSY		2	X		0	0	0		5				X		0	0	4			0	
2007060 PIP Preamp	X		X		0								X		1	0	4			0	
2007064 Temp. Control Module	X		X		0	0	0		5						1	0	4			0	
2018637 Temp. Control Thermo.	X	2	X		0	0	0		5						1	0	4			0	
2007170 Temp/ Alarm Module	X		X		0	0	0								1	0	4			0	
2018636 Temp. Alarm Thermo.	X		X		0	0	0								1	0	4			0	
2007171 Blower Control Module	X		X		0	0	0	0							1	0	4			0	
2018635 Blower Control Thermo	X		X		0	0	0	0							1	0	4			0	
2018641 Heater SM	X		X		0	0	0		5						1	0	4			0	
2018741 Htr & T.M. Assy IRIG	X		X		0	0	0		5						0	0	4			0	
2007019 Transformer	X		X		0				5				0	0	1	0	4			0	
2007204 Precision Resolver Module	X		X		0							0					4			0	
2018644 Blower	X		X		0			0							1	0	4	0		0	

TABLE II (Continued)

PART REPLACED - NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1	4.3.5.1.3	4.3.5.2	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
2018609 L.G.S.A. T.M., O.A.			X		0				5	X					X	X	4			0	
2018610 L.G.S.A. T.M., M.A.			X		0				5	X					X	0	4			0	(See Note 6)
2018611 L.G.S.A. T.M., L.A.			X		0				5	X					0	0	4			0	
2018612 L.G.S.A. Resolver O.A.			X		0				5		X	0			X	X	4	0	0	0	(See Note 6)
2018613 L.G.S.A. Resolver MA			X		0				5		X				X	0	4			0	
2018614 L.G.S.A. Resolver L.A.			X		0				5		X			0	0	0	4			0	(See Note 6)
2018738 Case Mach. Assy.			X	0	0	0	0		5						0	0	0			0	
1010353 Relay	X		X					0									4	0		0	

CODE 0 - Perform requirements of complete paragraph

X - Perform requirements of the paragraph applicable to the component replaced or other component or assembly affected.

1. Weights of replacement parts shall be compared with parts removed and rebalanced only if the change will cause the unbalance to exceed the original requirements. Record calculations in history log.
2. Reselect padding resistors per 3.2.2.2 only if PIP and IRIG temperature requirements per 4.3.5.5.b at 20 percent duty cycle are not met. Do not reselect R2.
3. PIP and IRIG temperatures shall be checked per 4.3.5.5.a and per 4.3.5.5.b at 50 percent control heater duty cycle only.
4. The Pressure Test shall be performed when an IMU is repaired subsequent to Inertial Subsystem testing prior to IMU shipment.
5. PIP and IRIG temperatures shall be checked per 4.3.5.5.b at 20 percent duty cycle only.
6. Use adapter cable to maintain PIP and IRIG temperatures during replacement operation.

TABLE III

TEST REQUIRED PER SPECIFICATION PS2016152 (LEM)

PART REPLACED - NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1 a&b	4.3.5.1.3 a&b	4.3.5.2.a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16
2021500 25 IRIG		2	X		0	0	0	0	0	3					X	0	0	4			0
2018844 PIP CALIB. ASSY.		2	X		0	0	0	0	0	5				X		0	0	4			0
2007060 PIP Preamp	X		X		0									X		1	0	4			0
2007064 Temp. Control Module	X		X		0	0	0			5						1	0	4			0
2018826 Temp Control Thermo	X	2	X		0	0	0			5						1	0	4			0
2007170 Temp/ Alarm Module	X		X		0	0	0									1	0	4			0
2007172 Blower Control Module	X		X		0	0	0	0								1	0	4			0
2018825 Blower Control Thermo	X		X		0	0	0	0								1	0	4			0
2018641 Heater SM	X		X		0	0	0			5						1	0	4			0
2018741 Htr & T.M. Assy IRIG	X		X		0	0	0			5						0	0	4			0
2007019 Transformer	X		X		0					5				0	0	1	0	4			0
2007204 Precision Resolver Module	X		X		0								0					4			0
2018644 Blower	X		X		0			0								1	0	4	0		0
2018824 Temp Alarm Thermo Lo Limit	X		X		0	0										1	0	4			0
2018823 Temp Alarm Thermo Hi Limit	X		X		0		0									1	0	4			0

TABLE III (Continued)

PART REPLACED– NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1.a&b	4.3.5.1.3.a&b	4.3.5.2.a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
2018609 L.G.S.A. T.M., O.A.			X		0	0	0			5	X					X	X	4			0	
2018610 L.G.S.A. T.M., M.A.			X		0	0				5	X					X	0	4			0	(See Note 6)
2018611 L.G.S.A. T.M., L.A.			X		0	0	0			5	X					0	0	4			0	
2018612 L.G.S.A. Resolver O.A.			X		0	0	0	0		5		X	0			X	X	4	0	0	0	(See Note 6)
2018613 L.G.S.A. Resolver MA			X		0	0	0			5		X				X	0	4			0	
2018614 L.G.S.A. Resolver L.A.			X		0	0	0			5		X			0	0	0	4			0	(See Note 6)
2018738 Case Mach. Assy.			X	0	0	0	0			5						0	0	0			0	
1010353 Relay	X		X					0										4	0		0	

CODE 0 – Perform requirements of complete paragraph

X – Perform requirements of the paragraph applicable to the component replaced or other component or assembly affected.

1. Weights of replacement parts shall be compared with parts removed and rebalanced only if the change will cause the unbalance to exceed the original requirements. Record calculations in history log.
2. Reselect padding resistors per 3.2.2.2 only if PIP and IRIG temperature requirements per 4.3.5.5.b at 20 percent duty cycle are not met. Do not reselect R2.
3. PIP and IRIG temperatures shall be checked per 4.3.5.5.a and per 4.3.5.5.b at 50 percent control heater duty cycle only.
4. The Pressure Test shall be performed when an IMU is repaired subsequent to Inertial Subsystem testing prior to IMU shipment.
5. PIP and IRIG temperatures shall be checked per 4.3.5.5.b at 20 percent duty cycle only.
6. Use adapter cable to maintain PIP and IRIG temperatures during replacement operation.

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5/4/67	A	33713	4, 6-11 R04/AC	MGM EA	--
6/8/67	B	33923	4, 6, 8, 10 RNG/AC	MGM EA	—

This specification consists of page 1 to 11 inclusive.

APPROVALS	NASA/MSC	2.24.67	MIT/IL	CCB	R. Temple 2-7-67 AC	

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the IMU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the IMU shall be subjected to all testing specified in 4.3 of the applicable procurement specification, PS2016154 (Block II), PS2018601 (Block II or LEM), or PS2016152 (LEM).

4.3 MINIMUM RETEST. The IMU shall be subjected to the applicable test(s) listed in either Table I (Block II), Table II (Block II or LEM), or Table III (LEM). Whenever the IMU is opened for inspection or component retest, the following tests shall be performed subsequent to the inspection or component retest in order to insure optimum IMU performance.

a. Resistance per 4.3.4 of the applicable procurement specification
b. Insulation Resistance per 4.3.16 of the applicable procurement specification
c. Gimbal Torque per 4.3.12 of the applicable procurement specification
d. Phasing tests as applicable, subsequent to component level retest.
e. Perform complete PIP and IRIG phasing tests per 4.3.9 and 4.3.10 of the applicable procurement specification subsequent to a component level retest of a PIP or IRIG.

5. PREPARATION FOR DELIVERY

5.1 GENERAL. Preparation for delivery shall be in accordance with Specification ND1002214.

6. NOTES

6.1 PRODUCT PERFORMANCE AND CONFIGURATION REQUIREMENTS/QUALITY VERIFICATION CROSS REFERENCE INDEX (per the applicable specification, PS2016154, PS2018601 or PS2016152).

Test/Examination	Requirement	Method
Heat Exchanger Leak Rate	3.1.2.1	4.3.2
Heat Exchanger Pressure Drop	3.1.2.2	4.3.3
PIPA Temperature	3.1.2.3	4.3.5.5
IRIG Temperature	3.1.2.4	4.3.5.5
Temperature Alarm Limits	3.1.2.7	4.3.5.1
Blower Operation	3.1.2.8	4.3.5.2
Torque Motor Phasing	3.1.2.12	4.3.6
1X and 16X Resolver Phasing	3.1.2.13	4.3.7
Precision Resolver Alignment Module	3.1.2.14	4.3.8
PIP Phasing	3.1.2.15	4.3.9
IRIG and Gyro Error Resolver Phasing	3.1.2.16	4.3.10
Balance	3.1.2.17	4.3.11
Gimbal Torque	3.1.2.18	4.3.12
Pressure	3.1.2.19	4.3.13
Telemetry Signal Outputs	3.1.2.20	4.3.14
PTC Interlock	3.1.2.21	4.3.15

TABLE I

TEST REQUIRED PER SPECIFICATION PS2016154 (BLOCK II)

PART REPLACED-NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1a&b	4.3.5.1.3a&b	4.3.5.2a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16
2021500 25 IRIG		2	X		0	0	0	0	0	3				0	0	0	0	4			0
2018844 PIP CALIB. ASSY.		2	X		0	0	0	0	0	5				0	0	0	0	4			0
2007060 PIP Preamp	X		X		0									X		1	0	4			0
2007064 Temp. Control Module	X		X		0	0	0			5						1	0	4			0
2018826 Temp. Control Thermo	X	2	X		0	0	0			5						1	0	4			0
2007170 Temp/ Alarm Module	X		X		0	0	0									1	0	4			0
2007172 Blower Control Module	X		X		0	0	0	0								1	0	4			0
2018825 Blower Control Thermo	X		X		0	0	0	0								1	0	4			0
2018641 Heater SM	X		X		0	0	0			5						1	0	4			0
2018741 Htr & T. M. Assy IRIG	X		X		0	0	0			5						0	0	4			0
2007019 Trans-former	X		X		0					5				0	0	1	0	4			0
2007204 Precision Resolver Module	X		X		0								0				0	4			0
2018644 Blower	X		X		0			0								1	0	4	0		0
2018824 Temp Alarm Thermo Lo Limit	X		X		0	0										1	0	4			0
2018823 Temp Alarm Thermo Hi Limit	X		X		0		0									1	0	4			0

TABLE II

TEST REQUIRED PER SPECIFICATION PS2018601 (BLOCK II & LEM)

PART REPLACED - NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1	4.3.5.1.3	4.3.5.2	4.3.5.5	4.3.6.	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16
2021500 25 IRIG		2	X		0	0	0		3				0	0	0	0	4			0
2018844 PIP CALIB ASSY		2	X		0	0	0		5				0	0	0	0	4			0
2007060 PIP Preamp	X		X		0								X		1	0	4			0
2007064 Temp. Control Module	X		X		0	0	0		5						1	0	4			0
2018637 Temp. Control Thermo.	X	2	X		0	0	0		5						1	0	4			0
2007170 Temp/ Alarm Module	X		X		0	0	0								1	0	4			0
2018636 Temp. Alarm Thermo.	X		X		0	0	0								1	0	4			0
2007171 Blower Control Module	X		X		0	0	0	0							1	0	4			0
2018635 Blower Control Thermo	X		X		0	0	0	0							1	0	4			0
2018641 Heater SM	X		X		0	0	0		5						1	0	4			0
2018741 Htr & T.M. Assy IRIG	X		X		0	0	0		5						0	0	4			0
2007019 Transformer	X		X		0				5				0	0	1	0	4			0
2007204 Precision Resolver Module	X		X		0							0					4			0
2018644 Blower	X		X		0			0							1	0	4	0		0

TABLE III

TEST REQUIRED PER SPECIFICATION PS2016152 (LEM)

PART REPLACED - NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1 a&b	4.3.5.1.3 a&b	4.3.5.2.a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
2021500 25 IRIG		2	X		0	0	0	0	0	3				0	0	0	0	4			0	
2018844 PIP CALIB. ASSY.		2	X		0	0	0	0	0	5				0	0	0	0	4			0	
2007060 PIP Preamp	X		X		0									X		1	0	4			0	
2007064 Temp. Control Module	X		X		0	0	0			5						1	0	4			0	
2018826 Temp Control Thermo	X	2	X		0	0	0			5						1	0	4			0	
2007170 Temp/ Alarm Module	X		X		0	0	0									1	0	4			0	
2007172 Blower Control Module	X		X		0	0	0	0								1	0	4			0	
2018825 Blower Control Thermo	X		X		0	0	0	0								1	0	4			0	
2018641 Heater SM	X		X		0	0	0			5						1	0	4			0	
2018741 Htr & T.M. Assy IRIG	X		X		0	0	0			5						0	0	4			0	
2007019 Transformer	X		X		0					5				0	0	1	0	4			0	
2007204 Precision Resolver Module	X		X		0								0					4			0	
2018644 Blower	X		X		0			0								1	0	4	0		0	
2018824 Temp Alarm Thermo Lo Limit	X		X		0	0										1	0	4			0	
2018823 Temp Alarm Thermo Hi Limit	X		X		0		0									1	0	4			0	

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This specification consists of page 1 to 11 inclusive.

APPROVALS	NASA/MSC	2.24.67	MIT/IL	CCB	R. Temple 3-3-67 AC	

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the IMU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the IMU shall be subjected to all testing specified in 4.3 of the applicable procurement specification, PS2016154 (Block II), PS2018601 (Block II or LEM), or PS2016152 (LEM).

4.3 MINIMUM RETEST. The IMU shall be subjected to the applicable test(s) listed in either Table I (Block II), Table II (Block II or LEM), or Table III (LEM). Whenever the IMU is opened for inspection or component retest, the following tests shall be performed subsequent to the inspection or component retest in order to insure optimum IMU performance.

a. Resistance per 4.3.4 of the applicable procurement specification
b. Insulation Resistance per 4.3.16 of the applicable procurement specification
c. Gimbal Torque per 4.3.12 of the applicable procurement specification
d. Phasing tests as applicable, subsequent to component level retest.
e. Perform complete PIP and IRIG phasing tests per 4.3.9 and 4.3.10 of the applicable procurement specification subsequent to a component level retest of a PIP or IRIG.

5. PREPARATION FOR DELIVERY

5.1 GENERAL. Preparation for delivery shall be in accordance with Specification ND1002214.

5.2 RESTORATION OF THE RESOLVER ALIGNMENT MODULE ADJUSTMENT CAPABILITY. The sealant on the Resolver Alignment module (A7) shall be removed prior to delivery of the IMU whenever any of the gimbal halves are removed.

6. NOTES

6.1 PRODUCT PERFORMANCE AND CONFIGURATION REQUIREMENTS/QUALITY VERIFICATION CROSS REFERENCE INDEX (per the applicable specification, PS2016154, PS2018601 or PS2016152).

Test/Examination	Requirement	Method
Heat Exchanger Leak Rate	3.1.2.1	4.3.2
Heat Exchanger Pressure Drop	3.1.2.2	4.3.3
PIPA Temperature	3.1.2.3	4.3.5.5
IRIG Temperature	3.1.2.4	4.3.5.5
Temperature Alarm Limits	3.1.2.7	4.3.5.1
Blower Operation	3.1.2.8	4.3.5.2
Torque Motor Phasing	3.1.2.12	4.3.6
1X and 16X Resolver Phasing	3.1.2.13	4.3.7
Precision Resolver Alignment Module	3.1.2.14	4.3.8
PIP Phasing	3.1.2.15	4.3.9
IRIG and Gyro Error Resolver Phasing	3.1.2.16	4.3.10
Balance	3.1.2.17	4.3.11
Gimbal Torque	3.1.2.18	4.3.12
Pressure	3.1.2.19	4.3.13
Telemetry Signal Outputs	3.1.2.20	4.3.14
PTC Interlock	3.1.2.21	4.3.15

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APPROVALS	NASA/MSC	Robt Crogg 2.24.67	MIT/IL	CCB	R. Temple 8-3-67 G.I. AC	

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the IMU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the IMU shall be subjected to all testing specified in 4.3, except 4.3.2 Heat Exchanger Leak Rate, of the applicable procurement specification, PS2016154 (Block II), PS2018601 (Block II or LEM), or PS2016152 (LEM).

4.2.1 Heat Exchanger. The heat exchanger and quick disconnect couplings shall not leak when pressurized with coolant as specified in 3.9 to 90-94 psig for one hour.

4.3 MINIMUM RETEST. The IMU shall be subjected to the applicable test(s) listed in either Table I (Block II), Table II (Block II or LEM), or Table III (LEM). Whenever the IMU is opened for inspection or component retest, the following tests shall be performed subsequent to the inspection or component retest in order to insure optimum IMU performance.

a. Resistance per 4.3.4 of the applicable procurement specification
b. Insulation Resistance per 4.3.16 of the applicable procurement specification
c. Gimbal Torque per 4.3.12 of the applicable procurement specification
d. Phasing tests as applicable, subsequent to component level retest.
e. Perform complete PIP and IRIG phasing tests per 4.3.9 and 4.3.10 of the applicable procurement specification subsequent to a component level retest of a PIP or IRIG.

5. PREPARATION FOR DELIVERY

5.1 GENERAL. Preparation for delivery shall be in accordance with Specification ND1002214.

5.2 RESTORATION OF THE RESOLVER ALIGNMENT MODULE ADJUSTMENT CAPABILITY. The sealant on the Resolver Alignment module (A7) shall be removed prior to delivery of the IMU whenever any of the gimbal halves are removed.

6. NOTES

6.1 PRODUCT PERFORMANCE AND CONFIGURATION REQUIREMENTS/QUALITY VERIFICATION CROSS REFERENCE INDEX (per the applicable specification, PS2016154, PS2018601 or PS2016152).

Test/Examination	Requirement	Method
Heat Exchanger Leak Rate	3.1.2.1	4.3.2
Heat Exchanger Pressure Drop	3.1.2.2	4.3.3
PIPA Temperature	3.1.2.3	4.3.5.5
IRIG Temperature	3.1.2.4	4.3.5.5
Temperature Alarm Limits	3.1.2.7	4.3.5.1
Blower Operation	3.1.2.8	4.3.5.2
Torque Motor Phasing	3.1.2.12	4.3.6
1X and 16X Resolver Phasing	3.1.2.13	4.3.7
Precision Resolver Alignment Module	3.1.2.14	4.3.8
PIP Phasing	3.1.2.15	4.3.9
IRIG and Gyro Error Resolver Phasing	3.1.2.16	4.3.10
Balance	3.1.2.17	4.3.11
Gimbal Torque	3.1.2.18	4.3.12
Pressure	3.1.2.19	4.3.13
Telemetry Signal Outputs	3.1.2.20	4.3.14
PTC Interlock	3.1.2.21	4.3.15

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APPROVALS	NASA/MSC	2.24.67	MIT/IL	CCB	2-7-67 AC

TABLE I (Continued)

PART REPLACED- NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1 a & b	4.3.5.1.3 a & b	4.3.5.2a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
2018609 I.G.S.A. T.M., O.A.			X		0					5	X					X	X	4			0	
2018610 I.G.S.A. T.M., M.A.			X		0					5	X					X	0	4			0	(See Note 6)
2018611 I.G.S.A. T.M., I.A.			X		0					5	X					0	0	4			0	
2018612 I.G.S.A. Resolver O.A.			X		0			0		5		X	0			X	X	4	0	0	0	(See Note 6)
2018613 I.G.S.A. Resolver MA			X		0					5		X				X	0	4			0	
2018614 I.G.S.A. Resolver I.A.			X		0					5		X			0	0	0	4			0	(See Note 6)
2018738 Case Mach. Assy.			X	0	0	0	0			5						0	0	0			0	
1010353 Relay	X		X					0										4	0		0	

CODE 0 - Perform requirements of complete paragraph

X - Perform requirements of the paragraph applicable to the component replaced or other component or assembly affected.

1. Weights of replacement parts shall be compared with parts removed and rebalanced only if the change will cause the unbalance to exceed the original requirements. Record calculations in history log.
2. Reselect padding resistors per 3.2.2.2 only if PIP and IRIG temperature requirements per 4.3.5.5.b ~~(except see Note 7)~~ at 20 percent duty cycle are not met. Do not reselect R2.
3. PIP and IRIG temperatures shall be checked per 4.3.5.5.a and per 4.3.5.5.b (except see Note 7) at 50 percent control heater duty cycle only.
4. The Pressure Test shall be performed when an IMU is repaired subsequent to Inertial Subsystem testing prior to IMU shipment.
5. PIP and IRIG temperatures shall be checked per 4.3.5.5b (except see Note 7) at 20 percent duty cycle only.
6. Use adapter cable to maintain PIP and IRIG temperatures during replacement operation.
7. The average PIP temperature shall be 129.2±0.6°F with a maximum instability of ±0.2°F.

TABLE II (Continued)

PART REPLACED - NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1	4.3.5.1.3	4.3.5.2	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
2018609 L.G.S.A. T.M., O.A.			X		0				5	X					X	X	4			0	
2018610 L.G.S.A. T.M., M.A.			X		0				5	X					X	0	4			0	(See Note 6)
2018611 L.G.S.A. T.M., I.A.			X		0				5	X					0	0	4			0	
2018612 L.G.S.A. Resolver O.A.			X		0				5		X	0			X	X	4	0	0	0	(See Note 6)
2018613 L.G.S.A. Resolver MA			X		0				5		X				X	0	4			0	
2018614 L.G.S.A. Resolver I.A.			X		0				5		X			0	0	0	4			0	(See Note 6)
2018738 Case Mach. Assy.			X	0	0	0	0		5						0	0	0			0	
1010353 Relay	X		X					0									4	0		0	

CODE 0 - Perform requirements of complete paragraph

X - Perform requirements of the paragraph applicable to the component replaced or other component or assembly affected.

1. Weights of replacement parts shall be compared with parts removed and rebalanced only if the change will cause the unbalance to exceed the original requirements. Record calculations in history log.
2. Reselect padding resistors per 3.2.2.2 only if PIP and IRIG temperature requirements per 4.3.5.5.b (except see Note 7) at 20 percent duty cycle are not met. Do not reselect R2.
3. PIP and IRIG temperatures shall be checked per 4.3.5.5.a and per 4.3.5.5.b (except see Note 7) at 50 percent control heater duty cycle only.
4. The Pressure Test shall be performed when an IMU is repaired subsequent to Inertial Subsystem testing prior to IMU shipment.
5. PIP and IRIG temperatures shall be checked per 4.3.5.5.b (except see Note 7) at 20 percent duty cycle only.
6. Use adapter cable to maintain PIP and IRIG temperature during replacement operation.
7. The average PIP temperature shall be 129.4±0.6°F with a maximum instability of ±0.2°F.

TABLE III (Continued)

PART REPLACED- NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1a&b	4.3.5.1.3a&b	4.3.5.2.a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	...
2018609 L.G.S.A. T.M., O.A.			X		0					5	X					X	X	4			0	
2018610 L.G.S.A. T.M., M.A.			X		0					5	X					X	0	4			0	(See Note 6)
2018611 L.G.S.A. T.M., I.A.			X		0					5	X					0	0	4			0	
2018612 L.G.S.A. Resolver O.A.			X		0			0		5		X	0			X	X	4	0	0	0	(See Note 6)
2018613 L.G.S.A. Resolver MA			X		0					5		X				X	0	4			0	
2018614 L.G.S.A. Resolver I.A.			X		0					5		X			0	0	0	4			0	(See Note 6)
2018738 Case Mach. Assy.			X	0	0	0	0			5						0	0	0			0	
1010353 Relay	X		X					6										4	0		0	

CODE 0 - Perform requirements of complete paragraph

X - Perform requirements of the paragraph applicable to the component replaced or other component or assembly affected.

1. Weights of replacement parts shall be compared with parts removed and rebalanced only if the change will cause the unbalance to exceed the original requirements. Record calculations in history log.
2. Reselect padding resistors per 3.2.2.2 only if PIP and IRIG temperature requirements per 4.3.5.5.b (except see Note 7) at 20 percent duty cycle are not met. Do not reselect R2.
3. PIP and IRIG temperatures shall be checked per 4.3.5.5.a and per 4.3.5.5.b ~~(except see~~ Note 7) at 50 percent control heater duty cycle only.
4. The Pressure Test shall be performed when an IMU is repaired subsequent to Inertial Subsystem testing prior to IMU shipment.
5. PIP and IRIG temperatures shall be checked ~~per 4.3.5.5.b (except see Note 7) at 20 percent duty~~ cycle only.
6. Use adapter cable to maintain PIP and IRIG temperatures during replacement operation.
7. The average PIP temperature shall be 130.2±0.6°F with a maximum instability of ±0.2°F.

APOLLO G&N Specification
ND1002360 REV- F
Original Issue Date: 2 MAR 67
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GFP RETEST SPECIFICATION
FOR
INERTIAL MEASURING UNIT ASSEMBLIES
(BLOCK II & LEM)

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised		Approvals AC	Approvals NASA
5/4/67	A	33713	4, 6-11	RDG/AC	MGM EA	--
6/8/67	B	33923	4, 6, 8, 10	RDG/AC	MGM EA	--
6/8/67	C	33926	4	RDG/AC	MGM EA	--
7/27/67	D	34230	4	RDG/AC	MGM EA	--
10/12/67	E	34832	7, 9, 11	RDG/AC	MGM EA	--
11/16/67	F	35102	3, 4	JH/AC	MGM EA	--

This specification consists of page 1 to 11 inclusive.

APPROVALS	NASA/MSC	Rob Crisp 2.24.67	MIT/IL	CCB	R. Temple 2-3-67 AC	

3. REQUIREMENTS

3.1 TEST CONDITIONS. Test conditions for the IMU shall be as specified in the applicable procurement specification, PS2016154 (Block II), PS2018601 (Block II or LEM), or PS2016152(LEM).

3.1.1 Heater Power. Whenever heater power is not applied through connector J-1 or the temperature is not maintained through the use of the Portable Temperature Controller, the complete IMU assembly shall be maintained at 130° ±5°F with the use of a hood.

3.1.2 Snap-In Bellows. Whenever the IMU has coolant in the heat exchanger passages without being connected to a coolant supply, a snap-in bellows shall be installed.

3.2 REPLACEMENT SUBASSEMBLIES AND COMPONENTS. Only subassemblies and components that have met the requirements of their applicable procurement documents or drawings, as applicable, shall be used as replacement subassemblies and components.

3.3 WORKMANSHIP. Unless otherwise specified, all assembly and testing performed under this specification shall be in accordance with the requirements of the Drawing Compliance paragraph of the applicable procurement document.

3.4 MASKING. When stripping lead wires, soldering or repairing broken solder connections on the IMU, the area surrounding the repair shall be masked off to prevent any foreign matter from contaminating the IMU.

3.5 ROTATION OF SUBASSEMBLIES. When rotating the Stable Member or the gimbals, care shall be exercised so as to ensure that the assemblies are rotated less than 30°/sec and that hands are kept off the modules and wiring harnesses during rotation.

3.6 WIRE STRAIN. When removing or replacing any subassembly or component, care shall be exercised to ensure that there is no strain applied to the wires.

3.7 PROTECTIVE COVER. When work is not being accomplished on the IMU during repair or retest, the production case cover or the temporary plastic case cover shall be installed.

3.8 IMU STORAGE. When the IMU is to be stored in excess of 48 hours, the IMU heat exchanger shall be purged and filled with dry air or nitrogen at 1 atmosphere pressure.

3.9 COOLANT COMPOSITION. The coolant composition used in the liquid coolant loop shall be in accordance with the applicable specification as specified in 3.1.

3.10 PRECAUTIONS. The situations which led to the repair or replacement of a nonconforming subassembly may also have induced a malfunction in other subassemblies. Before proceeding with retest of the IMU, detailed investigation is required regarding the proper operation of all subassemblies which interact with the nonconforming unit.

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the IMU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the IMU shall be subjected to all testing specified in 4.3, except 4.3.2 Heat Exchanger Leak Rate, of the applicable procurement specification, PS2016154 (Block II), PS2018601 (Block II or LEM), or PS2016152 (LEM). The PIP temperature shall meet the requirements specified in 4.2.2.

4.2.1 Heat Exchanger. The heat exchanger and quick disconnect couplings shall not leak when pressurized with coolant as specified in 3.9 to 90-94 psig for one hour.

4.2.2 PIP Temperature. The average PIP shall be within ±0.6°F of the nominal specified in Para. 4.3.5.5 of the applicable procurement specification with a maximum instability of ±0.2°F.

4.3 MINIMUM RETEST. The IMU shall be subjected to the applicable test(s) listed in either Table I (Block II), Table II (Block II or LEM), or Table III (LEM). Whenever the IMU is opened for inspection or component retest, the following tests shall be performed subsequent to the inspection or component retest in order to insure optimum IMU performance.

a. Resistance per 4.3.4 of the applicable procurement specification
b. Insulation Resistance per 4.3.16 of the applicable procurement specification
c. Gimbal Torque per 4.3.12 of the applicable procurement specification
d. Phasing tests as applicable, subsequent to component level retest.
e. Perform complete PIP and IRIG phasing tests per 4.3.9 and 4.3.10 of the applicable procurement specification subsequent to a component level retest of a PIP or IRIG.

5. PREPARATION FOR DELIVERY

5.1 GENERAL. Preparation for delivery shall be in accordance with Specification ND1002214.

5.2 RESTORATION OF THE RESOLVER ALIGNMENT MODULE ADJUSTMENT CAPABILITY. The sealant on the Resolver Alignment module (A7) shall be removed prior to delivery of the IMU whenever any of the gimbal halves are removed.

6. NOTES

6.1 PRODUCT PERFORMANCE AND CONFIGURATION REQUIREMENTS/QUALITY VERIFICATION CROSS REFERENCE INDEX (per the applicable specification, PS2016154, PS2018601 or PS2016152).

Test/Examination	Requirement	Method
Heat Exchanger Leak Rate	3.1.2.1	4.3.2
Heat Exchanger Pressure Drop	3.1.2.2	4.3.3
PIPA Temperature	3.1.2.3	4.3.5.5
IRIG Temperature	3.1.2.4	4.3.5.5
Temperature Alarm Limits	3.1.2.7	4.3.5.1
Blower Operation	3.1.2.8	4.3.5.2
Torque Motor Phasing	3.1.2.12	4.3.6
1X and 16X Resolver Phasing	3.1.2.13	4.3.7
Precision Resolver Alignment Module	3.1.2.14	4.3.8
PIP Phasing	3.1.2.15	4.3.9
IRIG and Gyro Error Resolver Phasing	3.1.2.16	4.3.10
Balance	3.1.2.17	4.3.11
Gimbal Torque	3.1.2.18	4.3.12
Pressure	3.1.2.19	4.3.13
Telemetry Signal Outputs	3.1.2.20	4.3.14
PTC Interlock	3.1.2.21	4.3.15

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GFP RETEST SPECIFICATION

FOR

INERTIAL MEASURING UNIT ASSEMBLIES

(BLOCK II & LEM)

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				AC	NASA
5/4/67	A	33713	4, 6-11 RDG/AC	MGM EA	--
6/8/67	B	33923	4, 6, 8, 10 RDG/AC	MGM EA	--
6/8/67	C	33926	4 RDG/AC	MGM EA	--
7/27/67	D	34230	4 RDG/AC	MGM EA	--
10/12/67	E	34832	7, 9, 11 RDG/AC	MGM EA	--
11/16/67	F	35102	3, 4 JH/AC	MGM EA	--
2/8/68	G	35573	4, 7, 9, 11; was 11 pages, is now	MGM EA	--
			13 pages.		

This specification consists of page 1 to 13 inclusive.

APPROVALS	NASA/MSC	2.24.67	MIT/IL	CCB	2-3-67 AC	

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the IMU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the IMU shall be subjected to all testing specified in Table IV. The PIP temperature shall meet the requirements specified in 4.2.2.

4.3 MINIMUM RETEST. The IMU shall be subjected to the applicable test(s) listed in either Table I (Block II), Table II (Block II or LEM), or Table III (LEM). Whenever the IMU is opened for inspection or component retest, the following tests shall be performed subsequent to the inspection or component retest in order to insure optimum IMU performance.

a. Resistance per 4.3.4 of the applicable procurement specification
b. Insulation Resistance per 4.3.16 of the applicable procurement specification
c. Gimbal Torque per 4.3.12 of the applicable procurement specification
d. Phasing tests as applicable, subsequent to component level retest.
e. Perform complete PIP and IRIG phasing tests per 4.3.9 and 4.3.10 of the applicable procurement specification subsequent to a component level retest of a PIP or IRIG.

5. PREPARATION FOR DELIVERY

5.1 GENERAL. Preparation for delivery shall be in accordance with Specification ND1002214.

5.2 RESTORATION OF THE RESOLVER ALIGNMENT MODULE ADJUSTMENT CAPABILITY. The sealant on the Resolver Alignment module (A7) shall be removed prior to delivery of the IMU whenever any of the gimbal halves are removed.

6. NOTES

6.1 PRODUCT PERFORMANCE AND CONFIGURATION REQUIREMENTS/QUALITY VERIFICATION CROSS REFERENCE INDEX (per the applicable specification, PS2016154, PS2018601 or PS2016152).

Test/Examination	Requirement	Method
Heat Exchanger Leak Rate	3.1.2.1	4.3.2
Heat Exchanger Pressure Drop	3.1.2.2	4.3.3
PIPA Temperature	3.1.2.3	4.3.5.5
IRIG Temperature	3.1.2.4	4.3.5.5
Temperature Alarm Limits	3.1.2.7	4.3.5.1
Blower Operation	3.1.2.8	4.3.5.2
Torque Motor Phasing	3.1.2.12	4.3.6
1X and 16X Resolver Phasing	3.1.2.13	4.3.7
Precision Resolver Alignment Module	3.1.2.14	4.3.8
PIP Phasing	3.1.2.15	4.3.9
IRIG and Gyro Error Resolver Phasing	3.1.2.16	4.3.10
Balance	3.1.2.17	4.3.11
Gimbal Torque	3.1.2.18	4.3.12
Pressure	3.1.2.19	4.3.13
Telemetry Signal Outputs	3.1.2.20	4.3.14
PTC Interlock	3.1.2.21	4.3.15

TABLE I (Continued)

PART REPLACED– NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1 a & b	4.3.5.1.3 a & b	4.3.5.2a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
2018609 I.G.S.A. T.M., O.A.			X		0					5	X					X	X	4			0	
2018610 I.G.S.A. T.M., M.A.			X		0					5	X					X	0	4			0	(See Note 6)
2018611 I.G.S.A. T.M., I.A.			X		0					5	X					0	0	4			0	
2018612 I.G.S.A. Resolver O.A.			X		0			0		5		X	0			X	X	4	0	0	0	(See Note 6)
2018613 I.G.S.A. Resolver MA			X		0					5		X				X	0	4			0	
2018614 I.G.S.A. Resolver I.A.			X		0					5		X			0	0	0	4			0	(See Note 6)
2018738 Case Mach. Assy.			X	0	0	0	0			5						0	0	0			0	
1010353 Relay	X		X					0										4	0		0	

CODE 0 - Perform requirements of complete paragraph

X - Perform requirements of the paragraph applicable to the component replaced or other component or assembly affected,

1. Weights of replacement parts shall be compared with parts removed and rebalanced only if the change will cause the unbalance to exceed the original requirements. Record calculations in history log.
2. Reselect padding resistors per 3.2.2.2 only if PIP and IRIG temperature requirements per 4.3.5.5.b (except see Note 7) at 20 percent duty cycle are not met. Do not reselect R2.
3. PIP and IRIG temperatures shall be checked per 4.3.5.5.b at 20 percent control heater duty cycle and during Blower Operation Test, 4.3.5.2.a.
4. The Pressure Test shall be performed when an IMU is repaired subsequent to Inertial Subsystem testing prior to IMU shipment.
5. PIP and IRIG temperatures shall be checked per 4.3.5.5b (except see Note 7) at 20 percent duty cycle only.
6. Use adapter cable to maintain PIP and IRIG temperatures during replacement operation.
7. The average PIP temperature shall be 129.2±0.6°F with a maximum instability of ±0.2°F.

TABLE II (Continued)

PART REPLACED - NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1	4.3.5.1.3	4.3.5.2	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
2018609 L.G.S.A. T.M., O.A.			X		0				5	X					X	X	4			0	
2018610 L.G.S.A. T.M., M.A.			X		0				5	X					X	0	4			0	(See Note 6)
2018611 L.G.S.A. T.M., L.A.			X		0				5	X					0	0	4			0	
2018612 L.G.S.A. Resolver O.A.			X		0				5		X	0			X	X	4	0	0	0	(See Note 6)
2018613 L.G.S.A. Resolver MA			X		0				5		X				X	0	4			0	
2018614 L.G.S.A. Resolver L.A.			X		0				5		X			0	0	0	4			0	(See Note 6)
2018738 Case Mach. Assy.			X	0	0	0	0		5						0	0	0			0	
1010353 Relay	X		X					0									4	0		0	

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1. Weights of replacement parts shall be compared with parts removed and rebalanced only if the change will cause the unbalance to exceed the original requirements. Record calculations in history log.
2. Reselect padding resistors per 3.2.2.2 only if PIP and IRIG temperature requirements per 4.3.5.5.b (except see Note 7) at 20 percent duty cycle are not met. Do not reselect R2.
3. PIP and IRIG temperatures shall be checked per 4.3.5.5.b.
4. The Pressure Test shall be performed when an IMU is repaired subsequent to Inertial Subsystem testing prior to IMU shipment.
5. PIP and IRIG temperatures shall be checked per 4.3.5.5.b (except see Note 7) at 20 percent duty cycle only.
6. Use adapter cable to maintain PIP and IRIG temperature during replacement operation.
7. The average PIP temperature shall be 129.4±0.6°F with a maximum instability of ±0.2°F.

TABLE III (Continued)

PART REPLACED- NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1a & b	4.3.5.1.3a & b	4.3.5.2.a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	...
2018609 L.G.S.A. T.M., O.A.			X		0					5	X					X	X	4			0	
2018610 L.G.S.A. T.M., M.A.			X		0					5	X					X	0	4			0	(See Note 6)
2018611 L.G.S.A. T.M., I.A.			X		0					5	X					0	0	4			0	
2018612 L.G.S.A. Resolver O.A.			X		0			0		5		X	0			X	X	4	0	0	0	(See Note 6)
2018613 L.G.S.A. Resolver MA			X		0					5		X				X	0	4			0	
2018614 L.G.S.A. Resolver I.A.			X		0					5		X			0	0	0	4			0	(See Note 6)
2018738 Case Mach. Assy.			X	0	0	0	0			5						0	0	0			0	
1010353 Relay	X		X					0										4	0		0	

CODE 0 - Perform requirements of complete paragraph

X - Perform requirements of the paragraph applicable to the component replaced or other component or assembly affected.

1. Weights of replacement parts shall be compared with parts removed and rebalanced only if the change will cause the unbalance to exceed the original requirements. Record calculations in history log.
2. Reselect padding resistors per 3.2.2.2 only if PIP and IRIG temperature requirements per 4.3.5.5.b (except see Note 7) at 20 percent duty cycle are not met. Do not reselect R2.
3. PIP and IRIG temperatures shall be checked per 4.3.5.5.b at 20 percent control heater duty cycle and during Blower Operation Test, 4.3.5.2.a.
4. The Pressure Test shall be performed when an IMU is repaired subsequent to Inertial Subsystem testing prior to IMU shipment.
5. PIP and IRIG temperatures shall be checked per 4.3.5.5.b (except see Note 7) at 20 percent duty cycle only.
6. Use adapter cable to maintain PIP and IRIG temperatures during replacement operation.
7. The average PIP temperature shall be 130.2±0.6°F with a maximum instability of ±0.2°F.

TABLE IV

TESTS REQUIRED FOR RECERTIFICATION

TEST/EXAMINATION	METHOD - per applicable procurement specification PS 2016154 (Block II), PS 2018601 (Block II & LEM), or PS 2016152 (LEM), or as specified below.
PIP & IRIG Temperature	4.3.5.5.b (at 20% heater duty cycle only) NOTE: The average PIP temperature shall be within ±0.6° F of the nominal specified in 4.3.5.5 of the applicable procurement specification with a maximum instability of ±0.2° F.
Blower Operation & PIP & IRIG temperature	4.3.5.2.a (PIP & IRIG shall be stabilized and recorded and shall meet the requirements specified above.)
Telemetry Signal Outputs	4.3.14
Low Temperature Alarm - Operate	4.3.5.1.1.a and b
High Temperature Alarm Operate	4.3.5.1.3.a and b - Perform 4.3.5.1.3.c only if the heater padding resistors are reselected per 3.2.2.2.
PIP Phasing	4.3.9
IRIG & Gyro Error Resolver Phasing	4.3.10
Balance	4.3.11 - Rebalance required only if weight difference of the replacement part and the part removed exceeds the value specified in Table V, or if more than one part is changed since previous balance check.
Precision Resolver Alignment Module	4.3.8
Resistance	4.3.4
Insulation Resistance	4.3.16
Drawing Compliance	4.3.1
Continuity & DC Resistance	3.2.2.1 and 4.3.17 - Required only when a "soldered in" part is replaced.
Gimbal Torque	4.3.12
Selection of Heater Padding Resistors	3.2.2.2 and 4.3.17 - Required only when PIP or IRIG temperature limits specified above are exceeded.
Wheel Power, Blower, Fixed Heater and Bias Heater Current	4.3.5.3 - Required only when heater padding resistors are reselected, or when IRIG's are replaced.
Heat Exchanger and Quick Disconnect Coupling Leak Test	The heat exchanger and quick disconnect couplings shall not leak when pressurized with coolant as specified in 3.9 to 90-94 psig for one hour.

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Class A Release
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GFP RETEST SPECIFICATION

FOR

INERTIAL MEASURING UNIT ASSEMBLIES

(BLOCK II & LEM)

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				AC	NASA
5/4/67	A	33713	4, 6-11 RDG/AC	MGM EA	--
6/8/67	B	33923	4, 6, 8, 10 RDG/AC	MGM EA	--
6/8/67	C	33926	4 RDG/AC	MGM EA	--
7/27/67	D	34230	4 RDG/AC	MGM EA	--
10/12/67	E	34832	7, 9, 11 RDG/AC	MGM EA	--
11/16/67	F	35102	3, 4 JH/AC	MGM EA	--
2/8/68	G	35573	4, 7, 9, 11; was 11 pages, is now	MGM EA	--
			13 pages.		
4/11/68	H	36061	12	EA	--

This specification consists of page 1 to 13 inclusive.

APPROVALS
NASA/MSC
2.24.67
MIT/IL
CCA
R. Temple 2-7-67
AC

TABLE IV

TESTS REQUIRED FOR RECERTIFICATION

TEST/EXAMINATION	METHOD - per applicable procurement specification PS 2016154 (Block II), PS 2018601 (Block II & LEM), or PS 2016152 (LEM), or as specified below.
PIP & IRIG Temperature	4.3.5.5.b (at 20% heater duty cycle only) NOTE: The average PIP temperature shall be within ±0.6° F of the nominal specified in 4.3.5.5 of the applicable procurement specification with a maximum instability of ±0.2° F.
Blower Operation & PIP & IRIG temperature	4.3.5.2.a (PIP & IRIG shall be stabilized and recorded and shall meet the requirements specified above.)
Telemetry Signal Outputs	4.3.14
Low Temperature Alarm - Operate	4.3.5.1.1.a and b.
High Temperature Alarm Operate	4.3.5.1.3.
PIP Phasing	4.3.9
IRIG & Gyro Error Resolver Phasing	4.3.10
Balance	4.3.11 - Rebalance required only if weight difference of the replacement part and the part removed exceeds the value specified in Table V, or if more than one part is changed since previous balance check.
Precision Resolver Alignment Module	4.3.8
Resistance	4.3.4
Insulation Resistance	4.3.16
Drawing Compliance	4.3.1
Continuity & DC Resistance	3.2.2.1 and 4.3.17 - Required only when a "soldered in" part is replaced.
Gimbal Torque	4.3.12
Selection of Heater Padding Resistors	3.2.2.2 and 4.3.17 - Required only when PIP or IRIG temperature limits specified above are exceeded.
Wheel Power, Blower, Fixed Heater and Bias Heater Current	4.3.5.3 - Required only when heater padding resistors are reselected, or when IRIG's are replaced.
Heat Exchanger and Quick Disconnect Coupling Leak Test	The heat exchanger and quick disconnect couplings shall not leak when pressurized with coolant as specified in 3.9 to 90-94 psig for one hour.

TABLE I

TEST REQUIRED PER SPECIFICATION PS2016154 (BLOCK II)

PART REPLACED-NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1 a&b	4.3.5.1.3 a&b	4.3.5.2 a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
2021500 25 IRIG		2	X		0	0	0	8	0	3				0	0	0	0	4			0	
2018844 PIP CALIB. ASSY.		2	X		0	0	0	8	0	5				0	0	0	0	4			0	
2007060 PIP Preamp	X		X		0									X		1	0	4			0	
2007064 Temp. Control Module	X		X		0	0	0			5						1	0	4			0	
2018826 Temp. Control Thermo	X	2	X		0	0	0			5						1	0	4			0	
2007170 Temp/ Alarm Module	X		X		0	0	0									1	0	4			0	
2007172 Blower Control Module	X		X		0	0	0	8								1	0	4			0	
2018825 Blower Control Thermo	X		X		0	0	0	8								1	0	4			0	
2018641 Heater SM	X		X		0	0	0			5						1	0	4			0	
2018741 Htr & T.M. Assy IRIG	X		X		0	0	0			5						0	0	4			0	
2007019 Transformer	X		X		0					5				0	0	1	0	4			0	
2007204 Precision Resolver Module	X		X		0								0				0	4			0	
2018644 Blower	X		X		0			6	0							1	0	4	0		0	
2018824 Temp Alarm Thermo Lo Limit	X		X		0	0										1	0	4			0	
2018823 Temp Alarm Thermo Hi Limit	X		X		0		0									1	0	4			0	

TABLE I (Continued)

PART REPLACED– NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1 a & b	4.3.5.1.3 a & b	4.3.5.2a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
018609 I.G.S.A. T.M., O.A.			X		0					5	X					X	X	4			0	
2018610 I.G.S.A. T.M., M.A.			X		0					5	X					X	0	4			0	(See Note 6)
018611 I.G.S.A. T.M., I.A.			X		0					5	X					0	0	4			0	
2018612 I.G.S.A. Resolver O.A.			X		0			8		5		X	0			X	X	4	0	0	0	(See Note 6)
2018613 I.G.S.A. Resolver MA			X		0					5		X				X	0	4			0	
2018614 I.G.S.A. Resolver I.A.			X		0					5		X			0	0	0	4			0	(See Note 6)
2018738 Case Mach. Assy.			X	0	0	0	0			5						0	0	0			0	
1010353 Relay	X		X					8										4	0		0	

CODE 0 - Perform requirements of complete paragraph

X - Perform requirements of the paragraph applicable to the component replaced or other component or assembly affected,

1. Weights of replacement parts shall be compared with parts removed and rebalanced only if the change will cause the unbalance to exceed the original requirements. Record calculations in history log.
2. Reselect padding resistors per 3.2.2.2 only if PIP and IRIG temperature requirements per 4.3.5.5.b (except see Note 7) at 20 percent duty cycle are not met. Do not reselect R2.
3. PIP and IRIG temperatures shall be checked per 4.3.5.5.b at 20 percent control heater duty cycle and during Blower Operation Test, 4.3.5.2.a.
4. The Pressure Test shall be performed when an IMU is repaired subsequent to Inertial Subsystem testing prior to IMU shipment.
5. PIP and IRIG temperatures shall be checked per 4.3.5.5b (except see Note 7) at 20 percent duty cycle only.
6. Use adapter cable to maintain PIP and IRIG temperatures during replacement operation.
7. The average PIP temperature shall be 129.2±0.6°F with a maximum instability of ±0.2°F.
8. Blower cycling will occur with a 47 to 62 percent control heater duty cycle.

TABLE III

TEST REQUIRED PER SPECIFICATION PS2016152 (LEM)

PART EPLACED - ASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1 a&b	4.3.5.1.3 a&b	4.3.5.2.a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
1500 25 IRIG		2	X		0	0	0	8	0	3				0	0	0	0	4			0	
8844 PIP CALIB. SSY.		2	X		0	0	0	8	0	5				6	0	0	0	4			0	
7060 PIP Preamp	X		X		0									X		1	0	4			0	
7064 Temp. ontrol Module	X		X		0	0	0			5						1	0	4			0	
8826 Temp Control hermo	X	2	X		0	0	0			5						1	0	4			0	
7170 Temp/ larm Module	X		X		0	0	0									1	0	4			0	
7172 Blower ontrol Module	X		X		0	0	0	6								1	0	4			0	
8825 Blower ontrol Thermo	X		X		0	0	0	8								1	0	4			0	
8641 Heater SM	X		X		0	0	0			5						1	0	4			0	
8741 Htr & T.M. ssy IRIG	X		X		0	0	0			5						0	0	4			0	
7019 Transformer	X		X		0					5				0	0	1	0	4			0	
7204 Precision esolver Module	X		X		0								0					4			0	
8644 Blower	X		X		0			8								1	0	4	0		0	
8824 Temp Alarm hermo Lo Limit	X		X		0	0										1	0	4			0	
8823 Temp Alarm hermo Hi Limit	X		X		0		0									1	0	4			0	

TABLE III (Continued)

PART REPLACED-NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1a&b	4.3.5.1.3a&b	4.3.5.2.a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
018609 I.G.S.A. T.M., O.A.			X		0					5	X					X	X	4			0	
018610 I.G.S.A. T.M., M.A.			X		0					5	X					X	0	4			0	(See Note 6)
018611 I.G.S.A. T.M., I.A.			X		0					5	X					0	0	4			0	
018612 I.G.S.A. Resolver O.A.			X		0			8		5		X	0			X	X	4	0	0	0	(See Note 6)
018613 I.G.S.A. Resolver MA			X		0					5		X				X	0	4			0	
018614 I.G.S.A. Resolver I.A.			X		0					5		X			0	0	0	4			0	(See Note 6)
018738 Case Mach. Assy.			X	0	0	0	0			5						0	0	0			0	
010353 Relay	X		X					8										4	0		0	

ODE 0 - Perform requirements of complete paragraph

X - Perform requirements of the paragraph applicable to the component replaced or other component or assembly affected.

1. Weights of replacement parts shall be compared with parts removed and rebalanced only if the change will cause the unbalance to exceed the original requirements. Record calculations in history log.
2. Reselect padding resistors per 3.2.2.2 only if PIP and IRIG temperature requirements per 4.3.5.5.b (except see Note 7) at 20 percent duty cycle are not met. Do not reselect R2.
3. PIP and IRIG temperatures shall be checked per 4.3.5.5.b at 20 percent control heater duty cycle and during Blower Operation Test, 4.3.5.2.a.
4. The Pressure Test shall be performed when an IMU is repaired subsequent to Inertial Subsystem testing prior to IMU shipment.
5. PIP and IRIG temperatures shall be checked per 4.3.5.5.b (except see Note 7) at 20 percent duty cycle only.
6. Use adapter cable to maintain PIP and IRIG temperatures during replacement operation.
7. The average PIP temperature shall be 130.2±0.6°F with a maximum instability of ±0.2°F.
8. Blower cycling will occur with a 47 to 62 percent control heater duty cycle.

TABLE IV

TESTS REQUIRED FOR RECERTIFICATION

TEST/EXAMINATION	METHOD - per applicable procurement specification PS 2016154 (Block II), PS 2018601 (Block II & LEM), or PS 2016152 (LEM), or as specified below.
PIP & IRIG Temperature	4.3.5.5.b (at 20% heater duty cycle only) NOTE: The average PIP temperature shall be within ±0.6° F of the nominal specified in 4.3.5.5 of the applicable procurement specification with a maximum instability of ±0.2° F.
Blower Operation & PIP & IRIG temperature	4.3.5.2.a (PIP & IRIG shall be stabilized and recorded and shall meet the requirements specified above.) Blower cycling will occur with a 47 to 62 percent control heater duty cycle.
Telemetry Signal Outputs	4.3.14
Low Temperature Alarm - Operate	4.3.5.1.1.a and b.
High Temperature Alarm Operate	4.3.5.1.3.
PIP Phasing	4.3.9
IRIG & Gyro Error Resolver Phasing	4.3.10
Balance	4.3.11 - Rebalance required only if weight difference of the replacement part and the part removed exceeds the value specified in Table V, or if more than one part is changed since previous balance check.
Precision Resolver Alignment Module	4.3.8
Resistance	4.3.4
Insulation Resistance	4.3.16
Drawing Compliance	4.3.1
Continuity & DC Resistance	3.2.2.1 and 4.3.17 - Required only when a "soldered in" part is replaced.
Gimbal Torque	4.3.12
Selection of Heater Padding Resistors	3.2.2.2 and 4.3.17 - Required only when PIP or IRIG temperature limits specified above are exceeded.
Wheel Power, Blower, Fixed Heater and Bias Heater Current	4.3.5.3 - Required only when heater padding resistors are reselected, or when IRIG's are replaced.
Heat Exchanger and Quick Disconnect Coupling Leak Test	The heat exchanger and quick disconnect couplings shall not leak when pressurized with coolant as specified in 3.9 to 90-94 psig for one hour.

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GFP RETEST SPECIFICATION

FOR

INERTIAL MEASURING UNIT ASSEMBLIES

(BLOCK II & LEM)

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5/4/67	A	33713	4, 6-11 RDG/AC	MGM EA	--
6/8/67	B	33923	4, 6, 8, 10 RDG/AC	MGM EA	--
6/8/67	C	33926	4 RDG/AC	MGM EA	--
7/27/67	D	34230	4 RDG/AC	MGM EA	--
10/12/67	E	34832	7, 9, 11 RDG/AC	MGM EA	--
11/16/67	F	35102	3, 4 JH/AC	MGM EA	--
2/8/68	G	35573	4, 7, 9, 11; was 11 pages, is now	MGM EA	--
			13 pages.		
4/11/68	H	36061	12	EA	--
5/5/69	J	37576	6, 7, 10, 11, 12	MGM EA	--
9/22/69	K	37816	3, 4, 6, 7, 9-12	MGM EA	MDH

This specification consists of page 1 to 13 inclusive.

APPROVALS	NASA/MSC	Robt Crisp 2.24.67	MIT/IL	CCB	2-3-67 AC	

TABLE I

TEST REQUIRED PER SPECIFICATION PS2016154 (BLOCK II)

PART REPLACED– NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1 a&b	4.3.5.1.3 a&b	4.3.5.2 a&c	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
2021500 25 IRIG		2	X		0	0	0	8	0	3				0	0	0	0	4			0	
2018844 PIP CALIB. ASSY.		2	X		0	0	0	8	0	5				0	0	0	0	4			0	
2007060 PIP Preamp	X		X		0									X		1	0	4			0	
2007064 Temp. Control Module	X		X		0	0	0			5						1	0	4			0	
2018826 Temp. Control Thermo	X	2	X		0	0	0			5						1	0	4			0	
2007170 Temp/ Alarm Module	X		X		0	0	0									1	0	4			0	
2007172 Blower Control Module	X		X		0	0	0	8								1	0	4			0	
2018825 Blower Control Thermo	X		X		0	0	0	8								1	0	4			0	
2018641 Heater SM	X		X		0	0	0			5						1	0	4			0	
2018741 Htr & T.M. Assy IRIG	X		X		0	0	0			5						0	0	4			0	
2007019 Trans-former	X		X		0					5				0	0	1	0	4			0	
2007204 Precision Resolver Module	X		X		0								0				0	4			0	
2018644 Blower	X		X		0			6	0							1	0	4	0		0	
2018824 Temp Alarm Thermo Lo Limit	X		X		0	0										1	0	4			0	
2018823 Temp Alarm Thermo Hi Limit	X		X		0		0									1	0	4			0	

TABLE III

TEST REQUIRED PER SPECIFICATION PS2016152 (LEM)

PART REPLACED - NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1 a&b	4.3.5.1.3 a&b	4.3.5.2 a&b	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
2021500 25 IRIG		2	X		0	0	0	8	0	3				0	5	0	0	4			0	
2018844 PIP CALIB. ASSY.		2	X		0	0	0	8	0	5				[illegible]	0	0	0	4			0	
2007060 PIP Preamp	X		X		0									X		1	0	4			0	
2007064 Temp. Control Module	X		X		0	0	0			5						1	0	4			0	
2018826 Temp Control Thermo	X	2	X		0	0	0			5						1	0	4			0	
2007170 Temp/ Alarm Module	X		X		0	0	0									1	0	4			0	
2007172 Blower Control Module	X		X		0	0	0	5								1	0	4			0	
2018825 Blower Control Thermo	X		X		0	0	0	8								1	0	4			0	
2018641 Heater SM	X		X		0	0	0			5						1	0	4			0	
2018741 Htr & T.M. Assy IRIG	X		X		0	0	0			5						0	0	4			0	
2007019 Transformer	X		X		0					5				0	0	1	0	4			0	
2007204 Precision Resolver Module	X		X		0								0					4			0	
2018644 Blower	X		X		0			8								1	0	4	0		0	
2018824 Temp Alarm Thermo Lo Limit	X		X		0	0										1	0	4			0	
2018823 Temp Alarm Thermo Hi Limit	X		X		0		0									1	0	4			0	
[illegible] Coupling																						(See Note 3)

TABLE IV

TESTS REQUIRED FOR RECERTIFICATION

TEST/EXAMINATION	METHOD - per applicable procurement specification PS 2016154 (Block II), PS 2018601 (Block II & LEM), or PS2016152 (LEM), or as specified below.
PIP & IRIG Temperature	4.3.5.5.b (at 20% heater duty cycle only) NOTE: The average PIP temperature shall be within ±0.6°F of the nominal specified in 4.3.5.5 of the applicable procurement specification with a maximum instability of ±0.2°F.
Blower Operation & PIP & IRIG temperature	4.3.5.2.a (PIP & IRIG shall be stabilized and recorded and shall meet the requirements specified above). Blower cycling will occur with a 47 to 62 percent control heater duty cycle. Check air flow direction per 4.3.5.2.c.
Telemetry Signal Outputs	4.3.14
Low Temperature Alarm - Operate	4.3.5.1.1.a and b.
High Temperature Alarm - Operate	4.3.5.1.3
PIP Phasing	4.3.9
IRIG & Gyro Error Resolver Phasing	4.3.10
Balance	4.3.11 - Rebalance required only if weight difference of the replacement part and the part removed exceeds the value specified in Table V, or if more than one part is changed since previous balance check.
Resistance	4.3.4
Insulation Resistance	4.3.16
Drawing Compliance	4.3.1
Continuity & DC Resistance	3.2.2.1 and 4.3.17 - Required only when a "soldered in" part is replaced.
Gimbal Torque	4.3.12
Selection of Heater Padding Resistors	3.2.2.2 and 4.3.17 - Required only when PIP or IRIG temperature limits specified above are exceeded.
Wheel Power, Blower, Fixed Heater and Bias Heater Current	4.3.5.3 - Required only when heater padding resistors are reselected, or when IRIG's are replaced.
Heat Exchanger and Quick Disconnect Coupling Leak Test	The heat exchanger and quick disconnect couplings shall not leak when pressurized with coolant as specified in 3.9 to 90-94 psig for one hour.

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INERTIAL MEASURING UNIT ASSEMBLIES

(BLOCK II & LEM)

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			13 pages.		
4/11/68	H	36061	12	EA	--
5/5/69	J	37576	6, 7, 10, 11,12	MGM EA	--
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This specification consists of page 1 to 13 inclusive.

APPROVALS	NASA/MSC	2.24.67	MIT/IL CCB	R. Temple 2-3-67 AC	

2/3/67

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(BLOCK II & LEM)

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This specification consists of page 1 to 12 inclusive.

APPROVALS	NASA/MSC	Rob Crisp 2.24.67	MIT/IL	CCA	R. Temple 2-20 ACSP

3. REQUIREMENTS

3.1 TEST CONDITIONS. Test conditions for the IMU shall be as specified in the applicable procurement specification, PS2016154 (Block II), PS2018601 (Block II or LEM), or PS2016152(LEM).

3.1.1 Heater Power. Whenever heater power is not applied through connector J-1 or the temperature is not maintained through the use of the Portable Temperature Controller, the complete IMU assembly shall be maintained at 130° ±5°F with the use of a hood.

3.1.2 Snap-In Bellows. Whenever the IMU has coolant in the heat exchanger passages without being connected to a coolant supply, a snap-in bellows shall be installed.

3.2 REPLACEMENT SUBASSEMBLIES AND COMPONENTS. Only subassemblies and components that have met the requirements of their applicable procurement documents or drawings, as applicable, shall be used as replacement subassemblies and components.

3.3 WORKMANSHIP. Unless otherwise specified, all assembly and testing performed under this specification shall be in accordance with the requirements of the Drawing Compliance paragraph of the applicable procurement document.

3.4 MASKING. When stripping lead wires, soldering or repairing broken solder connections on the IMU, the area surrounding the repair shall be masked off to prevent any foreign matter from contaminating the IMU.

3.5 ROTATION OF SUBASSEMBLIES. When rotating the Stable Member or the gimbals, care shall be exercised so as to ensure that the assemblies are rotated less than 30°/sec and that hands are kept off the modules and wiring harnesses during rotation.

3.6 WIRE STRAIN. When removing or replacing any subassembly or component, care shall be exercised to ensure that there is no strain applied to the wires.

3.7 PROTECTIVE COVER. When work is not being accomplished on the IMU during repair or retest, the production case cover or the temporary plastic case cover shall be installed.

3.8 IMU STORAGE. When the IMU is to be stored in excess of 48 hours, the IMU heat exchanger shall be purged and filled with dry air or nitrogen at 1 atmosphere pressure.

3.9 COOLANT COMPOSITION. The coolant composition used in the liquid coolant loop shall be in accordance with the applicable specification as specified in 3.1.

3.10 PRECAUTIONS. The situations which led to the repair or replacement of a nonconforming subassembly may also have induced a malfunction in other subassemblies. Before proceeding with retest of the IMU, detailed investigation is required regarding the proper operation of all subassemblies which interact with the nonconforming unit.

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the IMU shall consist of Recertification Testing or Minimum Retests, but not both. Additional testing may be specified by the ARRO.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the IMU shall be subjected to all testing specified in 4.8 of the applicable procurement specification, PS2016154 (Block II), PS2018601 (Block II or LEM), or PS2016152 (LEM).

4.3 MINIMUM RETEST. The IMU shall be subjected to the applicable test(s) listed in either Table I(Block II), Table II (Block II or LEM), or Table III (LEM). Whenever the IMU is opened for inspection or component retest, the following tests shall be performed subsequent to the inspection or component retest in order to insure optimum IMU performance.

a. Resistance per 4.3.12 of the applicable procurement specification
b. Insulation Resistance per 4.3.4 of the applicable procurement specification
c. Gimbal Torque per 4.3.16 of the applicable procurement specification
d. Phasing tests as applicable, subsequent to component level retest.

5. PREPARATION FOR DELIVERY

5.1 GENERAL. Preparation for delivery shall be in accordance with Specification ND1002214.

6. NOTES

6.1 PRODUCT PERFORMANCE AND CONFIGURATION REQUIREMENTS/QUALITY VERIFICATION CROSS REFERENCE INDEX (per the applicable specification, PS2016154, PS2018601 or PS2016152).

Test/Examination	Requirement	Method
Heat Exchanger Leak Rate	3.1.2.1	4.3.2
Heat Exchanger Pressure Drop	3.1.2.2	4.3.3
PIPA Temperature	3.1.2.3	4.3.5.5
IRIG Temperature	3.1.2.4	4.3.5.5
Temperature Alarm Limits	3.1.2.7	4.3.5.1
Blower Operation	3.1.2.8	4.3.5.2
Torque Motor Phasing	3.1.3.12	4.3.6
1X and 16X Resolver Phasing	3.1.2.13	4.3.7
Precision Resolver Alignment Module	3.1.2.14	4.3.8
PIP Phasing	3.1.2.15	4.3.9
IRIG and Gyro Error Resolver Phasing	3.1.2.16	4.3.10
Balance	3.1.2.17	4.3.11
Gimbal Torque	3.1.2.18	4.3.12
Pressure	3.1.2.19	4.3.13
Telemetry Signal Outputs	3.1.2.20	4.3.14
PTC Interlock	3.1.2.21	4.3.15
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

TABLE I

TEST REQUIRED PER SPECIFICATION PS2016154 (BLOCK II)

PART REPLACED-NASA Dwg. No.	3.2.3.1	3.2.3.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1a,b	4.3.5.1.2a,b	4.3.5.3a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16
2021500 25 IRIG		2	X		0	0	0	0	0	3					X	0	0	4			0
2018844 PIP CALIB. ASSY.		2	X		0	0	0	0	0	5				X		0	0	4			0
2007060 PIP Preamp	X		X		0									X		1	0	4			0
2007064 Temp. Control Module	X		X		0	0	0			5						1	0	4			0
2018826 Temp. Control Thermo	X	2	X		0	0	0			5						1	0	4			0
2007170 Temp/ Alarm Module	X		X		0	0	0									1	0	4			0
2007172 Blower Control Module	X		X		0	0	0	0								1	0	4			0
2018825 Blower Control Thermo	X		X		0	0	0	0								1	0	4			0
2018641 Heater SM	X		X		0	0	0			5						1	0	4			0
2018741 Htr & T.M. Assy IRIG	X		X		0	0	0			5						0	0	4			0
2007019 Transformer	X		X		0					5				0	0	1	0	4			0
2007204 Precision Receiver Module	X		X		0								0				0	4			0
2018644 Blower	X		X		0			0	0							1	0	4	0		0
2018824 Temp Alarm Thermo Lo Limit	X		X		0	0										1	0	4			0
2018823 Temp Alarm Thermo Hi Limit	X		X		0		0									1	0	4			0

TABLE I (Continued)

PART REPLACED- NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1 a & b	4.3.5.1.3 a & b	4.3.5.2a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
2018609 I.G.S.A. T.M., O.A.			X		0	0	0			5	X					X	0	4			0	
2018610 I.G.S.A. T.M., M.A.			X		0	0	0			5	X					X	0	4			0	(See Note 6)
2018611 I.G.S.A. T.M., I.A.			X		0	0	0			5	X					0	0	4			0	
2018612 I.G.S.A. Resolver O.A.			X		0	0	0	0		5		X	0			X	0	4	0	0	0	(See Note 6)
2018613 I.G.S.A. Resolver MA			X		0	0	0			5		X				X	0	4			0	
2018614 I.G.S.A. Resolver I.A.			X		0	0	0			5		X			0	0	0	4			0	(See Note 6)
2018738 Case Mach. Assy.			X	0	0	0	0			5						0	0	0			0	
1010353 Relay	X		X					0										4	0		0	

CODE 0 - Perform requirements of complete paragraph
X - Perform requirements of the paragraph applicable to the component replaced or other component or assembly affected,

1. Weights of replacement parts shall be compared with parts removed and rebalanced only if the change will cause the unbalance to exceed the original requirements. Record calculations in history log.
2. Reselect padding resistors per 3.2.2.2 only if PIP and IRIG temperature requirements per 4.3.5.5.b at 20 percent duty cycle are not met.
3. PIP and IRIG temperatures shall be checked per 4.3.5.5.a and per 4.3.5.5.b at 50 percent control heater duty cycle only.
4. The Pressure Test shall be performed when an IMU is repaired subsequent to Inertial Subsystem testing prior to IMU shipment.
5. PIP and IRIG temperatures shall be checked per 4.3.5.5b at 20 percent duty cycly only.
6. Use adapter cable to maintain PIP and IRIG temperatures during replacement operation.

TABLE II

TEST REQUIRED PER SPECIFICATION PS2018601 (BLOCK II & LEM)

PART REPLACED - NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1	4.3.5.1.3	4.3.5.2	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
2021500 25 IRIG		2	X		0	●	●		3					X	●	●	4			●	
2018844 PIP CALIB ASSY		2	X		●	●	●		5				X		●	●	4			●	
2007060 PIP Preamp	X		X		●								X		1	●	4			●	
2007064 Temp. Control Module	X		X		●	●	●		5						1	0	4			●	
2018637 Temp. Control Thermo.	X	2	X		●	●	●		5						1	●	4			●	
2007170 Temp/ Alarm Module	X		X		●	●	●								1	●	4			●	
2018636 Temp. Alarm Thermo.	X		X		●	●	●								1	●	4			●	
2007171 Blower Control Module	X		X		●	●	●	●							1	●	4			●	
2018635 Blower Control Thermo	X		X		●	●	●	●							1	●	4			●	
2018641 Heater SM	X		X		●	●	●		5						2	●	4			●	
2018741 Htr & T.M. Assy IRIG	X		X		●	●	●		5						●	●	4			●	
2007019 Transformer	X		X		●				5				●	●	1	●	4			●	
2007204 Precision Resolver Module	X		X		●							●				●	4			●	
2018644 Blower	X		X		●			●							1	●	4	●		●	

TABLE II (Continued)

PART REPLACED - NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1	4.3.5.1.3	4.3.5.2	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
2018600 L.G.S.A. T.M., O.A.			X		O				5	X					X	O	4			O	
2018610 L.G.S.A. T.M., M.A.			X		O				5	X					X	O	4			O	(See Note 6)
2018611 L.G.S.A. T.M., I.A.			X		O				5	X					O	O	4			O	
2018612 L.G.S.A. Resolver O.A.			X		O				5		X	O			X	O	4	O	O	O	(See Note 6)
2018613 L.G.S.A. Resolver MA			X		O				5		X				X	O	4			O	
2018614 L.G.S.A. Resolver I.A.			X		O				5		X			O	O	O	4			O	(See Note 6)
2018738 Case Mach. Assy.			X	O	O	O	O		5						O	O	O			O	
1010363 Relay	X		X					O									4	O		O	

CODE O - Perform requirements of complete paragraph
X - Perform requirements of the paragraph applicable to the component replaced or other component or assembly affected.

1. Weights of replacement parts shall be compared with parts removed and rebalanced only if the change will cause the unbalance to exceed the original requirements. Record calculations in history log.
2. Reselect padding resistors per 3.2.2.2 only if PIP and IRIG temperature requirements per 4.3.5.5.b at 20 percent duty cycle are not met.
3. PIP and IRIG temperatures shall be checked per 4.3.5.5.a and per 4.3.5.5.b at 50 percent control heater duty cycle only.
4. The Pressure Test shall be performed when an IMU is repaired subsequent to Inertial Subsystem testing prior to IMU shipment.
5. PIP and IRIG temperatures shall be checked per 4.3.5.5.b at 20 percent duty cycle only.
6. Use adapter cable to maintain PIP and IRIG temperatures during replacement operation.

TABLE III

TEST REQUIRED PER SPECIFICATION PS2016152 (LEM)

PART REPLACED - NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1 a,b	4.3.5.1.2 a,b	4.3.5.2.a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	
2021500 25 IRIG		2	X		0	0	0	0	0	3					X	0	0	4			0	
2018844 PIP CALIB. ASSY.		2	X		0	0	0	0	0	5				X		0	0	4			0	
2007060 PIP Preamp	X		X		0									X		1	0	4			0	
2007064 Temp. Control Module	X		X		0	0	0			5						1	0	4			0	
2018826 Temp Control Thermo	X	2	X		0	0	0			5						1	0	4			0	
2007170 Temp/ Alarm Module	X		X		0	0	0									1	0	4			0	
2007172 Blower Control Module	X		X		0	0	0	0								1	0	4			0	
2018825 Blower Control Thermo	X		X		0	0	0	0								1	0	4			0	
2018641 Heater SM	X		X		0	0	0			5						1	0	4			0	
2018741 Htr & T.M. Assy IRIG	X		X		0	0	0			5						0	0	4			0	
2007019 Transformer	X		X		0					5				0	0	1	0	4			0	
2007204 Precision Resolver Module	X		X		0								0				0	4			0	
2018644 Blower	X		X		0			0								1	0	4	0		0	
2018824 Temp Algrm Thermo Lo Limit	X		X		0	0										1	0	4			0	
2018823 Temp Alarm Thermo Hi Limit	X		X		0		0									1	0	4			0	

TABLE III (Continued)

PART REPLACED-NASA Dwg. No.	3.2.2.1	3.2.2.2	4.3.1	4.3.3	4.3.4	4.3.5.1.1a,b	4.3.5.1.3a,b	4.3.5.2.a	4.3.5.3	4.3.5.5	4.3.6	4.3.7	4.3.8	4.3.9	4.3.10	4.3.11	4.3.12	4.3.13	4.3.14	4.3.15	4.3.16	...
2018609 L.G.S.A. T.M., O.A.			X		0	0	0			5	X					X	0	4			0	
2018610 L.G.S.A. T.M., M.A.			X		0	0	0			5	X					X	0	4			0	(See Note 6)
2018611 L.G.S.A. T.M., L.A.			X		0	0	0			5	X					0	0	4			0	
2018612 L.G.S.A. Resolver O.A.			X		0	0	0	0		5		X	0			X	0	4	0	0	0	(See Note 6)
2018613 L.G.S.A. Resolver MA			X		0	0	0			5		X				X	0	4			0	
2018614 L.G.S.A. Resolver L.A.			X		0	0	0			5		X			0	0	0	4			0	(See Note 6)
2018738 Case Mach. Assy.			X	0	0	0	0			5						0	0	0			0	
1010353 Relay	X		X					0										4	0		0	

CODE 0 – Perform requirements of complete paragraph

X – Perform requirements of the paragraph applicable to the component replaced or other component or assembly affected.

1. Weights of replacement parts shall be compared with parts removed and rebalanced only if the change will cause the unbalance to exceed the original requirements. Record calculations in history log.
2. Reselect padding resistors per 3.2.2.2 only if PIP and IRIG temperature requirements per 4.3.5.5.b at 20 percent duty cycle are not met.
3. PIP and IRIG temperatures shall be checked per 4.3.5.5.a and per 4.3.5.5.b at 50 percent control heater duty cycle only.
4. The Pressure Test shall be performed when an IMU is repaired subsequent to Inertial Subsystem testing prior to IMU shipment.
5. PIP and IRIG temperatures shall be checked per 4.3.5.5.b at 20 percent duty cycle only.
6. Use adapter cable to maintain PIP and IRIG temperatures during replacement operation.

TABLE II

2021323

TEST SELECTION

REPLACED/REPAIRED COMPONENT	APPLICABLE PARAGRAPH IN SPECIFICATION PS2014578
Electro-Luminescent Lamps DS 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 17 (Drawing No. 1008943 or 1008944)	4.3.1, 4.3.2, 4.3.4 & 4.3.7
Condition Annunciator (Drawing No. 1010949) A3	4.3.1, 4.3.2, 4.3.4 & 4.3.7
Master Alarm Annunciator (Drawing No. 1008824) A4	4.3.1, 4.3.2, 4.3.3 (Table V only), 4.3.4 & 4.3.7
Sextant Hand Controller (Drawing No. 2014550) A1	4.3.1, 4.3.4 & 4.3.6*
Transformer T1 (Drawing No. 1010942)	4.3.1, 4.3.2, 4.3.4 & 4.3.6
Speed Controller Switch S1 (Drawing No. 1010902)	
Tracker Switch S2 (Drawing No. 1010902)	4.3.1, 4.3.2, 4.3.3 (Table III only) & 4.3.4
Mode Switch S3 (Drawing No. 1010903)	
Coupling Switch S4 (Drawing No. 1010905)	
Telescope Trunnion Switch S5 (Drawing No. 1010902)	
Mark Switch S6 (Drawing No. 1010904)	
Mark Reject Switch S7 (Drawing No. 1010904)	
Attitude Impulse Switch Assembly S8 (Drawing No. 2014700)	4.3.1, 4.3.2, 4.3.3 (Table IV only) & 4.3.4
Up Telemetry Switch S10 (Drawing No. 1010905)	4.3.1, 4.3.2, 4.3.3 (Table VI only) & 4.3.4
Condition Lamps Switch S12 (Drawing No. 1010903)	4.3.1, 4.3.2, 4.3.3 (Table V only), 4.3.4 & 4.3.7
Reticle Brightness Control Assembly (Drawing No. 2014656)	4.3.1, 4.3.2, 4.3.3 (Table VII only) & 4.3.4
Panel (Inseparable) (Drawing No. 2021349) Wiring Harness A (Drawing No. 2021321)	Complete PS2014578

*If the Sextant Hand Controller (SHC) is replaced, rather than repaired, these three tests will suffice. If the SHC is repaired, these tests plus portions of Specification PS2014550 shall also be performed, as follows: If the Disiccator only is repaired or replaced, the Pressure Differential test (4.2.8) of PS2014550 shall be performed. If any other repair or replacement to the SHC is made, all testr specified in PS2014550 shall be performed.

2/17/67

APOLLO G&N Specification
ND1002361 REV –
Original Issue Date: 6 APRIL 67
Release Authority: TDRR 33535
Class A Release
CODE IDENT NO. 80230

GFP RETEST SPECIFICATION

FOR

G&N INDICATOR CONTROL PANEL ASSEMBLY (BLOCK II)

DRAWING NO. 2014578

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				MIT	NASA

This specification consists of page 1 to 5 inclusive.

APPROVALS	NASA/MSC	28 Mar 67	MIT/IL	CCB	ACSP

1. SCOPE

1.1 PURPOSE. This specification establishes the test requirements for repaired GFP Block II G&N Indicator Control Panel Assemblies, hereafter called the assembly, which have been returned for repair or replacement of nonconforming subassemblies.

1.2 DEVIATIONS. Deviations from the requirements of this specification are permitted without waivers only as specified in the Apollo Repair Retest Order (ARRO) and as authorized by NASA/RASPO.

2. APPLICABLE DOCUMENTS

2.1 EFFECTIVE ISSUES. The following documents form a part of this specification to the extent specified herein.

SPECIFICATIONS

APOLLO G&N

ND1002214	General Specification for Preservation, Packaging, Packing and Container Marking of APOLLO Guidance and Navigation Major Assemblies, Assemblies, Subassemblies, Parts and Associated Ground Support Equipment
PS2014578	Procurement Specification, Product Configuration and Acceptance Test Requirements, G&N Indicator Control Panel Assembly, Drawing No. 2014578
PS2014550	Procurement Specification, Product Configuration and Acceptance Test Requirements, Sextant Hand Controller Assembly, Drawing No. 2014550

(Copies of specifications, standards, drawings, bulletins, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the Contracting Officer.)

2.2 CONFLICTING REQUIREMENTS. In event of a conflict between requirements, the following order of precedence shall apply. The contractor shall also notify MIT/IL APOLLO Management of the conflict.

a. The contract
b. This specification
c. Documents listed in this specification.

3. REQUIREMENTS

3.1 TEST CONDITIONS. Test conditions for the assembly shall be as specified in Specification PS2014578.

3.2 REPLACEMENT SUBASSEMBLIES. Only subassemblies that have met the requirements of their applicable procurement documents shall be used as replacement subassemblies.

3.3 PRECAUTIONS. The situations which led to the repair or replacement of a nonconforming subassembly may also have induced a malfunction in other subassemblies. Before proceeding with retest of the assembly, detailed investigation is required regarding the proper operation of all subassemblies which interact with the nonconforming unit.

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. Testing of the assembly shall consist of Recertification Testing or Minimum Retest, but not both. Additional testing may be specified by the ARRO.

4.2 RECERTIFICATION TESTING. Unless otherwise specified by the ARRO, the assembly shall be subjected to testing as follows:

a. When the Inseparable Panel and/or any soldered and encapsulated subassembly, except the Sextant Hand Controller Assembly (SHC), is repaired or replaced, all tests specified in Specification PS2014578 shall be performed.

b. When the SHC is replaced (not repaired) and any other subassembly is repaired or replaced, all tests specified in PS2014578 shall be performed.

c. When only the SHC is replaced, all tests specified in PS2014578, except the Workmanship-Vibration test, shall be performed.

d. When the SHC is repaired, the tests specified in Specification PS2014550 shall be performed in addition to the tests specified in either "b" or "c" (above) for replaced SHC's.

4.3 MINIMUM RETEST. The assembly shall be subjected to the applicable test(s) listed in Table I only when Minimum Retest is specified by the ARRO.

5. PREPARATION FOR DELIVERY

5.1 GENERAL. Preparation for delivery shall be in accordance with Specification ND1002214.

6. NOTES. None.

JD:lv

TABLE I

TEST SELECTION

REPLACED/REPAIRED COMPONENT	APPLICABLE PARAGRAPH IN SPECIFICATION PS2014578
Electro-Luminescent Flood Lamp DS 2, 3, 8, 9, 10, 12, 13, 14, 15 and 16 (Drawing No. 1010999)	4.3.1, 4.3.2, 4.3.4 & 4.3.7
Panel and Lamp Assembly (Condition Lamps-Up Telemetry Area) (Drawing No. 2014738)	
Panel and Lamp Assembly (Verb-Noun Area) (Drawing No. 2014737)	
Panel and Lamp Assembly (Major Mode Area) (Drawing No. 2014736)	
Panel and Lamp Assembly (Optics Area) (Drawing No. 2014735)	
Panel and Lamp Assembly (Mark-Mark Rej Area) (Drawing No. 2014719)	
Condition Annunciator (Drawing No. 1010949)	
Master Alarm Annunciator (Drawing No. 1008824)	4.3.1, 4.3.2, 4.3.3 (Table V only), 4.3.4 & 4.3.7
Sextant Hand Controller (Drawing No. 2014550)	4.3.1, 4.3.4, & 4.3.6 *
Transformer T1 (Drawing No. 1010942	4.3.1, 4.3.2, 4.3.4 & 4.3.6
Speed Controller Switch S1 (Drawing No. 1010902)	
Tracker Switch S2 (Drawing No. 1010902)	4.3.1, 4.3.2, 4.3.3 (Table III only) & 4.3.4
Mode Switch S3 (Drawing No. 1010903)	
Coupling Switch S4 (Drawing No. 1010905)	
Telescope Trunnion Switch S5 (Drawing No. 1010902)	
Mark Switch S6 (Drawing No. 1010904)	
Mark Reject Switch S7 (Drawing No. 1010904)	
Attitude Impulse Switch Assembly S8 (Drawing No. 2014700)	4.3.1, 4.3.2, 4.3.3 (Table IV only) & 4.3.4
Up Telemetry Switch S10 (Drawing No. 1010905)	4.3.1, 4.3.2, 4.3.3 (Table VI only) & 4.3.4
Condition Lamps Switch S12 (Drawing No. 1010903)	4.3.1, 4.3.2, 4.3.3 (Table V only), 4.3.4 & 4.3.7
Reticle Brightness Control Assembly (Drawing No. 2014656)	4.3.1, 4.3.2, 4.3.3 (Table VII only) & 4.3.4
Panel (Inseparable) (Drawing No. 2014626)	Complete PS2014578
Wiring Harness A (Drawing No. 2014622)	

*If the Sextant Hand Controller (SHC) is replaced, rather than repaired, these three tests will suffice. If the SHC is repaired, these tests plus portions of Specification PS2014550 shall also be performed, as follows: If the Dislocator only is repaired or replaced, the Pressure Differential test (4.2.8) of PS2014550 shall be performed. If any other repair or replacement to the SHC is made, all tests specified in PS2014550 shall be performed.

APOLLO G&N Retest Specification
Index
ND1002368 REV A
Original Issue Date: 14 APR 67
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APOLLO GUIDANCE & NAVIGATION

RETEST SPECIFICATION INDEX (BLOCK II)

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				CCB ~~MIT~~	NASA
14 APR	A	33615	All, Initial Release		—

This specification consists of page 1 to 2 inclusive.

APPROVALS	NASA/MSC		CCB ~~MIT/IL~~	ACSP

APOLLO G&N (GFP) RETEST SPECIFICATION INDEX (BLOCK II)

Item	Title	ND Number
1.	Block II Power and Servo Assemblies	ND1002299
2.	Coupling Data Units (Block II)	ND1002350
3.	Signal Conditioner Assemblies, C/M Flight-Qual	ND1002309
4.	Signal Conditioner Assemblies, C/M Operational	ND1002342
5.	Inertial Measuring Unit Assembly (Block II and LEM)	ND1002360
6.	G&N Indicator Control Panel Assembly (Block II)	ND1002361
7.	Guidance and Navigation Systems (Block II)	ND1002352
8.	CSM Inertial Subsystems (Block II)	ND1002347
9.	Optical Subsystems (Block II)	ND1002355

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APOLLO GUIDANCE & NAVIGATION

RETEST SPECIFICATION INDEX (BLOCK II)

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				CCB	NASA
Ⓜ 14 APR	A	33615	All, Initial Release		—
8/3/67	B	34269	2 JH/AC	EA	--

This specification consists of page 1 to 2 inclusive.

APPROVALS	NASA/MSC		CCB ~~MIT/IL~~	H.A. Cook AC	

APOLLO G&N (GFP) RETEST SPECIFICATION INDEX (BLOCK II)

Item	Title	ND Number
1.	Block II Power and Servo Assemblies	ND1002299
2.	Coupling Data Units (Block II)	ND1002350
3.	Signal Conditioner Assemblies, C/M Flight-Qual	ND1002309
4.	Signal Conditioner Assemblies, C/M Operational	ND1002342
5.	Inertial Measuring Unit Assembly (Block II and LEM)	ND1002360
6.	G&N Indicator Control Panel Assembly (Block II)	ND1002361
7.	Guidance and Navigation Systems (Block II)	ND1002352
8.	CSM Inertial Subsystems (Block II)	ND1002347
9.	Optical Subsystems (Block II)	ND1002355
10.	AGC/DSKY's	ND1002367

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APOLLO GUIDANCE & NAVIGATION

RETEST SPECIFICATION INDEX (LEM)

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APPROVALS	NASA/MSC	ccb ~~MIT/IL~~	ACSP

APOLLO G&N (GFP) RETEST SPECIFICATION INDEX (LEM)

Item	Title	ND Number
1.	LEM Power and Servo Assemblies	ND1002300
2.	Coupling Data Units (LEM)	ND1002351
3.	Signal Conditioner Assemblies, LEM Flight-Qual	ND1002310
4.	Signal Conditioner Assemblies, LEM Operational	ND1002343
5.	Inertial Measuring Unit Assembly (Block II and LEM)	ND1002360
6.	Guidance and Navigation Systems (LEM)	ND1002353
7.	LEM Inertial Subsystems	ND1002346

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RETEST SPECIFICATION INDEX (LEM)

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This specification consists of page 1 to 2 inclusive.

APPROVALS	NASA/MSC		CCB ~~MIT/IL~~	H.A. Cook T.A. Stoner AC

APOLLO G&N (GFP) RETEST SPECIFICATION INDEX (LEM)

Item	Title	ND Number
1.	LEM Power and Servo Assemblies	ND1002300
2.	Coupling Data Units (LEM)	ND1002351
3.	Signal Conditioner Assemblies, LEM Flight-Qual	ND1002310
4.	Signal Conditioner Assemblies, LEM Operational	ND1002343
5.	Inertial Measuring Unit Assembly (Block II and LEM)	ND1002360
6.	Guidance and Navigation Systems (LEM)	ND1002353
7.	LEM Inertial Subsystems	ND1002346
8.	AGC/DSKY's	ND1002367

VAULT MASTER

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SPECIFICATION
ACCEPTANCE RETEST REQUIREMENTS
AGC/DSKYS

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11-16-67	A	35089	1, 2, 3	FG	FA

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APPROVALS	NASA/MSC	W Stameris E C Hall 5/5/67 14 July 67 MIT/IL	CC 7/?/67	D.M. [illegible] 27 APR 67 [illegible] 4/22/67 R. P. [illegible] 4/28/67 RAY

VAULT MASTER

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SPECIFICATION
ACCEPTANCE RETEST REQUIREMENTS
AGC/DSKYS

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Date	Revision Letter	TDRR No.	Pages Revised	Approvals MIT		Approvals NASA	
11-16-67	A	35089	1, 2, 3		FG		FA
12-21-67	B	35336	1, 3	EB	FA	SB	FA
1/29/68	C	35517	1, 4	[illegible]	FG	[illegible]	FE

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APPROVALS	NASA/MSC	W Stameris ~~[illegible]~~ 14 July 67	E C Hall 5/5/67 MIT/IL	CC [illegible] 7/26/67	D.M. [illegible] 27 APR 67 R.P. [illegible] 4/28/67 RAY

4.2.2 **Minimum Retest**:

(a) The AGC shall be subjected to the selected testing of Table II applicable to the module(s) repaired or replaced.

(b) The DSKY(S) shall be subjected to the acceptance testing requirements of PS 2016015, with the following exception:
The electroluminescent indicators shall have an average intensity of 6 to 24 foot lamberts.

5. PREPARATION FOR DELIVERY

5.1 General. Preparation for delivery shall be in accordance with PS 2016007, PS 2016015, and ND 1002214.

6. NOTES

6.1 Table II. By taking the number of the nonconforming module or tray and finding it on Table II, the list of JDC's to be performed can be determined. An approximation of the test time can also be calculated by adding the time values for each group of JDC's performed. The JDC's listed in Table II shall be performed sequentially as defined in the Assembly Test Plan of PS 2016007.

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SPECIFICATION
ACCEPTANCE RETEST REQUIREMENTS
AGC/DSKYS

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11-16-67	A	35089	1, 2, 3	FG	FA
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1/29/68	C	35517	1, 4	Dma FG	aug FE
9/6/68	D	37879	1,4,5,6,7,9,10	SMS FA	SMS FA

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APPROVALS	NASA/MSC	W Stamens ~~C Mayo~~ 14 July 67 E C Hall 5/5/67 MIT/IL	CCB 7/25/67	D.M. Sleeper 27 APR 67 Slatt 4/25/67 R.P. Zagorsich 4/28/67 RAY

4.2.2 Minimum Retest:

(a) The AGC shall be subjected to the selected testing of Table II applicable to the module(s) repaired or replaced.

(b) The DSKY(s) shall be subjected to the acceptance testing requirements of PS 2016015, with the following exceptions:

1. The electroluminescent indicators shall have an average intensity of 6 to 24 foot lamberts.

2. The vibration retest shall be in accordance with the requirements of paragraphs 4.2.3.5 and 4.2.3.6.

4.2.3 VIBRATION RETEST

4.2.3.1 AGC

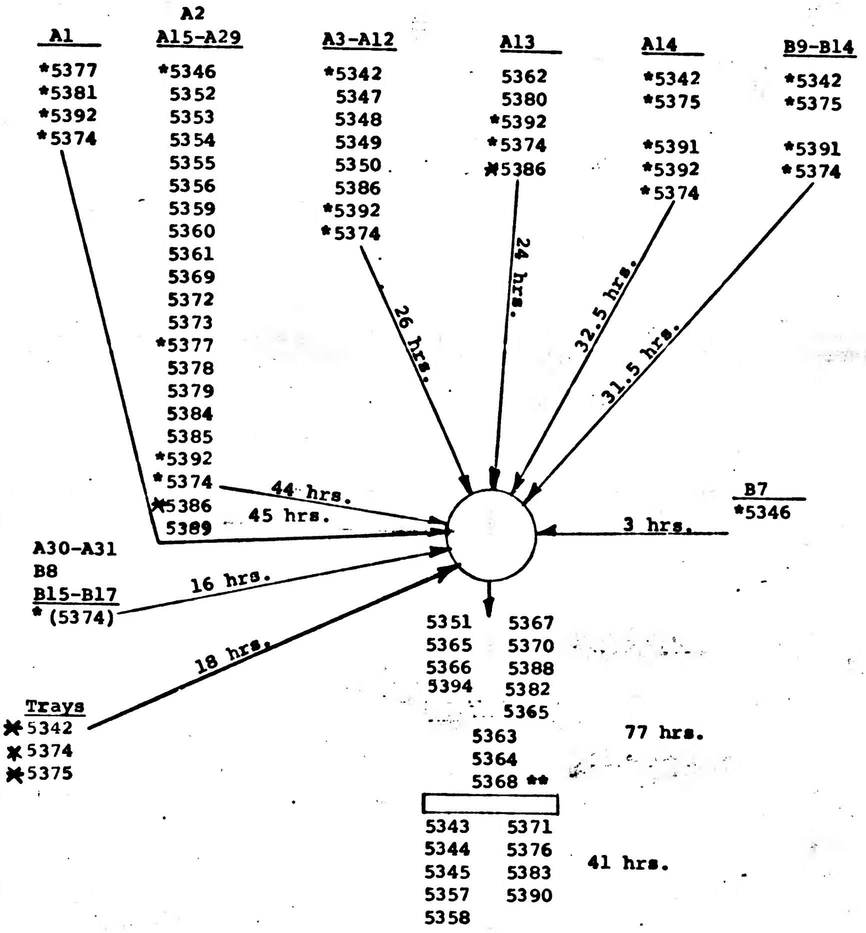
(A) If the AGC has not experienced JDC 5368 System Vibration, vibration of all Logic Modules will be performed on the Logic Module Vibration station as prescribed by the Logic Module Vibration profile.

(B) AGC System Vibration shall be performed when trays or modules are replaced, and the replaced trays or modules had not previously successfully passed vibration to their respective procurement specification or passed vibration at AGC system level.

Modules which have passed JDC 5368 may be used as replacement modules only in those locations in which they were tested during the AGC system level vibration, except as permitted by the interchangeability provisions of paragraphs 4.2.3.2, 4.2.3.3, and 4.2.3.4. If used in any other location, AGC system vibration per JDC 5368 will be performed subsequent to the module replacement.

(C) System vibration will be performed when the C tray and B tray have been separated.

TABLE II - Test Series for Particular Modules



NOTES: See TABLE III for JDC titles.
* Indicates JDC occurs more than once on chart.
All times are approximate values only.

** Refer to Note on Page 10

TABLE III

JDC	Description
05342	Adder Voltage & Frequency Test
05343	Equipment Set Up
05344	Equipment Power Turn On
05345	Computer Power Turn On
05346	AGC Clock Stability
05347	Central Registers Test
05348	Bank Registers Test
05349	Interrupt Registers Test
05350	Peripheral Channel-Instruction Test
05351	Marginal Voltage Test
05352	Radar Signal Measurements
05353	Downlink Signal Measurements
05354	Continuous Signal Characteristics
05355	Programmed Signal Characteristics Test
05356	C and RD Signals Test
05357	AGC Power Fail
05358	Scaler Double Frequency and Oscillator Alarm Test
05359	Hand Controller Test
05360	Input Counters Marginal Test
05361	Channel Inbits Marginal Test
05362	GOJAM Initialization Test
05363	AGC Mechanical Inspection
05364	AGC Subsystem Visual Inspection
05365	Weight Measurement
05366	Long Term Aging
05367	Thermal Cycling Test
05368*	Vibration Test - AGC (Random)
05369	PIPA Fail Test
05370	Voltage Variation Program Fail Test
05371	Leak Test
05372	Inlink Margin Test
05373	Increments Priority/Basic Instruction Test
05374	Marginal Frequency/Voltage & Thermal Test
05375	Worst Case Noise Erasable Memory Test
05376	Automatic Newspeak Test
05377	Timing Test
05378	Channel 30, 31, and 32 Test
05379	DSKY Test (Indicators & Keyboard)
05380	Alarms Test
05381	Scaler Test (24 hours)
05382	Standby - E Memory Test
05383	Warning Filter Alarm Test
05384	Priority of Interrupts
05385	DSKY spacecraft Signals
05386	Monitor Signals Test
05387	Vibration Test - DSKY
05388	CTS Control of Newspeak
05389	AGC Input Drivers Signal Measurements
05390	Bonding Continuity Measurements
05391	Erasable Memory Capacitor Selection
05392	Logic Signal Measurements
05393	DSKY Test Data
05394	Transient Voltage Test

* Perform JDC 05368 only according to the vibration retest criteria of Paragraph 4.2.3.

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SPECIFICATION
ACCEPTANCE RETEST REQUIREMENTS
AGC/DSKYS

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1. SCOPE

1.1 Purpose. This specification establishes the retest requirements for AGC Computers and/or Dsky's which have been returned either for repair or for replacement of modules or trays.

1.2 DEVIATIONS. Deviations from the requirements of this specification are permitted without waivers only as specified in the Apollo Repair Retest Order (ARRO) and as authorized by NASA/RASPO.

2. APPLICABLE DOCUMENTS

2.1 Effective Documents. The following documents form a part of this specification to the extent specified herein.

SPECIFICATIONS

PS 2016007	-	AGC Subsystem, Procurement Specification
PS 2016015	-	Display & Keyboard Assembly, Procurement Specification
ND 1002214	-	General Specification for Preservation, Packaging, Packing and Container Marking of APOLLO Guidance and Navigation Major Assemblies, Assemblies, Subassemblies, Parts and Associated Ground Support Equipment.

(Copies of specifications, standards, drawings, bulletins and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the Contracting Officer).

2.2 CONFLICTING REQUIREMENTS. In the event of conflict between the requirements of the contract, this specification and the documents listed in this section, the following order of precedence shall apply and the contractor shall notify MIT APOLLO Management of the conflict as soon as it is determined.

a. The contract

b. This specification

c. Documents listed in this section

3. REQUIREMENTS

3.1 Performance:

3.1.1 Replacement Modules: Only modules that have met the requirements of their individual procurement specifications shall be used as replacement modules.

3.1.2 Subsystems: Subsystems with replacement modules installed shall be capable of successfully passing the retests specified in Section 4.

3.2 Extent of Nonconformance. The situation which leads to the repair or replacement of a nonconforming module may also have induced a malfunction in other modules. Before proceeding with the repair or replacement of nonconforming modules or trays, investigation of interacting modules shall be performed to insure proper operation of these modules. The "As Received" tests listed in Section 4.2.1 shall be performed as part of the investigation.

4. QUALITY ASSURANCE PROVISIONS

4.1 Test Conditions. Test conditions shall be as specified in PS 2016007 and/or PS 2016015.

4.2 Tests. Prior to performing the tests (JDC's) specified herein, all prerequisite tests specified in the particular JDC shall be performed. Each JDC shall be performed in its entirety.

4.2.1 "As Received" Tests: These tests (JDC's) shall be performed prior to disassembly for repair.

(a) The AGC shall be subjected to the JDC's listed in Table I sequentially as shown in the Assembly Test Plan of PS 2016007.

(b) The DSKY(S) shall be evaluated, as necessary, to determine total nonconformity.

4.2.2 Minimum Retest:

(a) The AGC shall be subjected to the selected testing of Table II applicable to the module(s) repaired or replaced.

(b) The DSKY(S) shall be subjected to the acceptance testing requirements of PS 2016015.

5. PREPARATION FOR DELIVERY

5.1 General. Preparation for delivery shall be in accordance with PS 2016007, PS 2016015, and ND 1002214.

6. NOTES

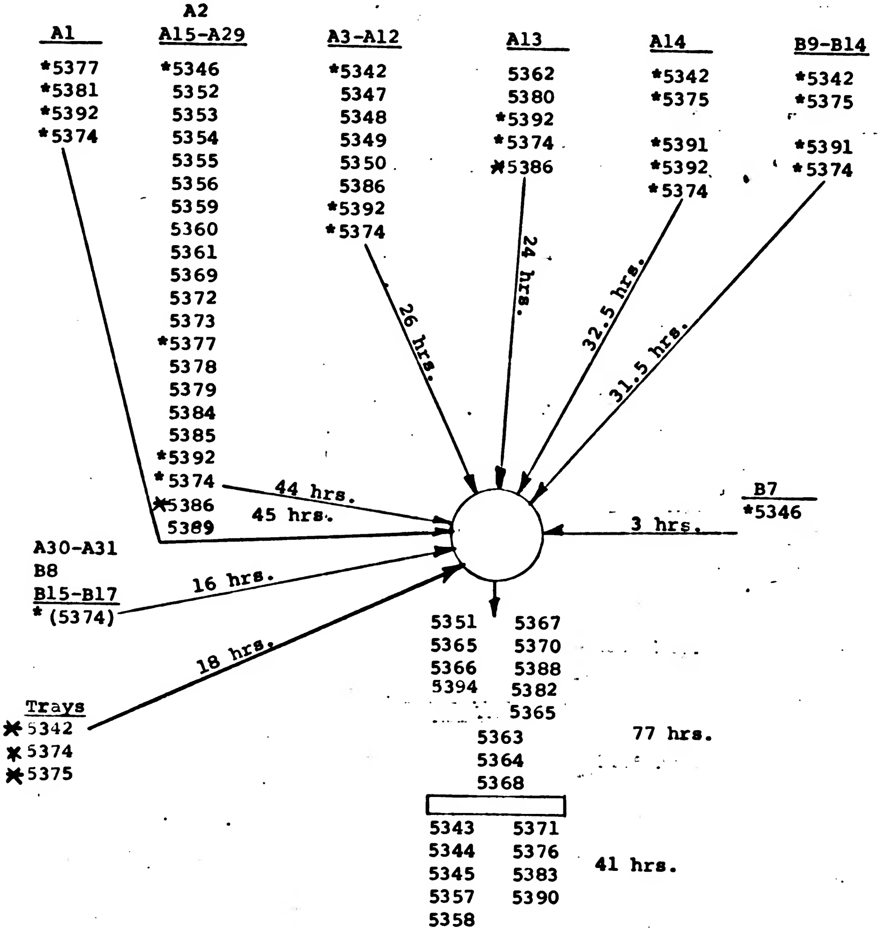
6.1 Table II. By taking the number of the nonconforming module or tray and finding it on Table II, the list of JDC's to be performed can be determined. An approximation of the test time can also be calculated by adding the time values for each group of JDC's performed. The JDC's listed in Table II shall be performed sequentially as defined in the Assembly Test Plan of PS 2016007.

TABLE I - " AS RECEIVED" AGC TESTS.

JDC	Description
05343	Equipment Set Up
05344	Equipment Power Turn On
05345	Computer Power Turn On
365799	Parity Correction
05346	AGC Clock Stability
05389	AGC Input Drivers
05357	AGC Power Fail
05351	Marginal Voltage Test
05386	Monitor Signals Test
05352	Radar Signal Measurements
05353	Downlink Signal Measurements
05354	Continuous Signal Measurements
05355	Programmed Signal Measurements
05356	C & RD Signal Test
05359	Hand Controller Test
05360	Input Counters Marginal Test
05361	Channel Inbits Marginal Test
05372	Inlink Margin Test
05347	Central Registers Test
05348	Bank Registers Test
05349	Interrupt Registers Test
05350	Peripheral Channel Ins. Test
05358	Scaler Double Freq. & Osc. Test
05362	GOJAM Initialization
05369	PIPA Fail Test
05373	Increments Priority Basic Ins.
05370	Voltage Variation Program Fail
05375	Worst Case Noise E-Memory Test
05376	Automatic Newspeak Test
05377	Timing Test
05378	Channel 30, 31, 32 Test
05379	DSKY Test (Indicators Keyboard)
05380	Alarms Test
05382	Standby E-Memory Test
05383	Warning Filter Alarm
05384	Priority of Interrupts
05385	DSKY Spacecraft Signals
05388	CTS Control of Newspeak

Reference: These JDC's are to be performed sequentially as shown in the Assembly Test Plan of PS 2016007.

TABLE II - Test Series for Particular Modules



NOTES:
See TABLE III for JDC titles.
* Indicates JDC occurs more than once on chart.
All times are approximate values only.

TABLE III

JDC	Description	JDC	Description
05342	Adder Voltage & Frequency Test	05368	Vibration Test - AGC (Random)
05343	Equipment Set Up	05369	PIPA Fail Test
05344	Equipment Power Turn On	05370	Voltage Variation Program Fail Test
05345	Computer Power Turn On	05371	Leak Test
05346	AGC Clock Stability	05372	Inlink Margin Test
05347	Central Registers Test	05373	Increments Priority/Basic Instruction Test
05348	Bank Registers Test	05374	Marginal Frequency/Voltage & Thermal Test
05349	Interrupt Registers Test	05375	Worst Case Noise Erasable Memory Test
05350	Peripheral Channel-Instruction Test	05376	Automatic Newspeak Test
05351	Marginal Voltage Test	05377	Timing Test
05352	Radar Signal Measurements	05378	Channel 30, 31, and 32 Test
05353	Downlink Signal Measurements	05379	DSKY Test (Indicators & Keyboard)
05354	Continuous Signal Characteristics	05380	Alarms Test
05355	Programmed Signal Characteristics Test	05381	Scaler Test (24 hours)
05356	C and RD Signals Test	05382	Standby - E Memory Test
05357	AGC Power Fail	05383	Warning Filter Alarm Test
05358	Scaler Double Frequency and Oscillator Alarm Test	05384	Priority of Interrupts
05359	Hand Controller Test	05385	DSKY spacecraft Signals
05360	Input Counters Marginal Test	05386	Monitor Signals Test
05361	Channel Inbits Marginal Test	05387	Vibration Test - DSKY
05362	GOJAM Initialization Test	05388	CTS Control of Newspeak
05363	AGC Mechanical Inspection	05389	AGC Input Drivers Signal Measurements
05364	AGC Subsystem Visual Inspection	05390	Bonding Continuity Measurements
05365	Weight Measurement	05391	Erasable Memory Capacitor Selection
05366	Long Term Aging	05392	Logic Signal Measurements
05367	Thermal Cycling Test	05393	DSKY Test Data
		05394	Transient Voltage Test

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PROCESS SPECIFICATION

IRIG AND PIP REPLACEMENTS

Record of Revisions

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				AC	NASA

This specification consists of page 1 to 38 inclusive.

APPROVALS	NASA/MSC	EM 7-31-68 MIT/IL	CCB 8/9/68	JNH C.H. Temple 6-6-68 AC

1. SCOPE

1.1 PURPOSE. This specification describes the process for replacing IRIG's or PIP's in the Inertial Measuring Unit (IMU) during field maintenance. All operations in this procedure shall be performed only by personnel who have previously performed IMU rework under factory supervision.

2. APPLICABLE DOCUMENTS

2.1 EFFECTIVE ISSUES. The following documents form a part of this specification to the extent specified herein.

SPECIFICATIONS

Military

MIL-G-4343	Grease, Pneumatic System

APOLLO G&N

ND1002346	GFP Retest Specification for LEM Inertial Subsystem
ND1002347	GFP Retest Specification for CSM Inertial Subsystem (Block II)
PS2016152	Procurement Specification, Inertial Measuring Unit Assembly, Drawing No. 2018601
PS2016154	Procurement Specification, Inertial Measuring Unit Assembly, Drawing No. 2018601

DRAWINGS

APOLLO G&N

1000022	Information Plate
1001488	Screw - Hex Soc. Hd. Self-Locking
1001489	Screw - Hex Soc. Hd.
1006879	Grease, Silicone, Dow Corning No. 4
2018601	IMU Assembly
2018602	Outer Axis Assembly
2018603	Middle Axis Assembly
2018605	Stable Member Assembly

3. REQUIREMENTS

3.1 RULES AND PRECAUTIONS WHEN WORKING ON THE IMU. The following procedures and rules are to be observed when working on the IMU:

3.1.1 Preinstallation Requirements. The PIP or IRIG being installed must meet the requirements of its procurement specification and shall have been subjected to vibration equivalent to that which is experienced by the component during IMU workmanship vibration. This shall be specified in the data package accompanying the IRIG or PIP.

3.1.2 Clean Room Requirements. The clean room or immediate area surrounding the IMU must meet the Clean Room requirements of Specification PS2016152 or PS2016154 before any covers are removed and at times when the IMU is not sealed. The IMU should be covered with plastic or other suitable material whenever it is open and not being worked upon.

3.1.3 Maintaining Heater Power. Heater power must be maintained during any rework to keep the temperature within 120° to 142°F. This shall be done with a Portable Temperature Controller, P/N 2900060, or equivalent. Power shall be removed from the external heater power source whenever making and breaking IRIG or PIPA connections. A "charged" IMU Shipping Container shall be kept available for emergency temperature control of the IMU.

3.1.4 Masking and Vacuuming Screw Hole. When removing or installing any screws that go into through holes, the bottom side of the screw hole shall be masked with tape, if accessible, to catch any contaminant that may come loose when the screw is turned. After the screw is removed or installed, vacuum the area and hole, remove the tape and vacuum again.

3.1.5 Vacuuming, Disassembly. When disassembling components, vacuum all edges and mating surfaces after loosening, then remove component and vacuum again.

3.1.6 Application, Heat Transfer Grease. As an aid in preventing contamination, the following method of applying Heat Transfer Grease (DC-4), P/N 1006879, shall be followed:

a. Wipe tube neck with lint-free material,
b. Squeeze required amount into a clean aluminum mixing dish,
c. Apply with clean, metal handle bristle brush.

3.1.7 Cleansing, Exterior Case Screw Holes for Cover and Connector End Mounts. Exterior screw holes for the Case Cover, and Connector End Mounts shall be cleaned by screwing a cotton swab soaked in alcohol through the insert followed by another cotton swab soaked in Freon.

3.1.8 Replacement, Inertial Component. Only one inertial component may be replaced in the field between balancing and temperature control calibration. Before starting any replacement on the IMU, check the IMU log book to verify that the IMU has not had an inertial component replaced previously in the field. If such is the case, the IMU must be returned to AC Electronics, Milwaukee, for inertial component replacement.

3.1.9 Locking, Middle and Outer Gimbals. Gimbal locks, FD771974, shall be used to lock the Middle and Outer Gimbals when removing or replacing any inertial component. Gimbal locks shall be mounted to the Case with a 10-32 screw and be approximately opposite each other.

3.2 SPECIAL TOOLS REQUIRED. The following special tools are required in replacing IRIG's and PIP's in the IMU:

a. FB-770875, Half-Shell Removal Tool (Qty 4)
b. FD-756120, PIP Removal Tool
c. Shims, P/N FA778130 (6 required)
d. Dummy Sensor, MTL 75996-2, IRIG
e. Dummy Sensor, MTL 75996-1, PIP
f. Portable Temperature Controller, P/N2900060-031 or equivalent
g. MTT1078, Torque Screw Driver, PIP Connector
h. MTT775, Torque Screw Driver, IRIG Connector
i. Sleeving - Protective, P/N1010490 or equivalent (3/16 or 1/4 inch ID; 2.0" min lgth)
j. PIP Mounting Block, FC 757067
k. PIP Storage Oven and IMU Shipping Container, P/N 1900010
m. FD771974, Gimbal Locks
n. IMU Pressure Seal Tester, P/N1900804

3.3 PROCEDURE SECTIONS. The procedures for replacing an IRIG or a PIP are divided into sections as follows. A suitable log of all operations performed shall be maintained. Particular attention shall be given to noting any harness clamps and spot ties removed.

a. IMU Disassembly
b. IRIG Removal
c. PIP Removal
d. IRIG Installation
e. PIP Installation
f. IMU Assembly

3.4 PROCEDURES

3.4.1 IMU Disassembly. IMU disassembly shall be performed as follows:

3.4.1.1 Removal, Case Cover (Reference Drawing No. 2018601.)

3.4.1.1.1 IMU Pressure Release. Release the IMU pressure by removing the IMU Pressure Relief Valve Cover and inserting the Hose Adapter from the IMU Pressure Seal Tester, P/N1900804. Mask off accessible holes per 3.1.4 for Case Cover and Connector Mounts.

3.4.1.1.2 Removal, Case Cover Screws. Remove the 12 Hex Socket Head Screws, P/N1001489-46, holding the Case Cover, P/N 2018710, (Blk II) or P/N2018839 (LEM) by loosening in half-turn increments until pressure is off the "O" ring. Remove the screws entirely, put in a container and save for reinstallation. Vacuum holes per 3.1.4 and clean per 3.1.7.

3.4.1.1.3 Removal, Cover. Remove the cover. Place in a plastic bag and store in a secure area.

3.4.1.3.9 Removal, OG Movable Half. Remove the Half-Shell by lifting straight and set aside. (Do not exert any force on the blower blades.)

3.4.1.4 Removal, MG Hemisphere Assembly. [illegible]. Removal of the Middle Gimbal Movable Hemisphere Assembly, P/N 2018757. (This is a part of the Housing Assembly, Middle Gimbal, P/N 2018758, and is shown removed in Zone B and C-6, Drawing No. 2018758.)

3.4.1.4.1 Removal and Hole Vacuuming, Hemisphere Assembly. Mask the tapped holes on the flanges opposite the sixteen screws that hold the Hemisphere Assemblies together. Then remove the screws, P/N 1001489-18. Vacuum the holes per 3.1.4.

3.4.1.4.2 Screw Removal and Vacuuming. Remove the six 6-32 Hex Socket Head Screws, P/N 1001489-18 (three on each end) that hold the Inner Gimbal Axis Bearing Housings to the Movable Hemisphere Assembly. Vacuum the tapped holes per 3.1.4.

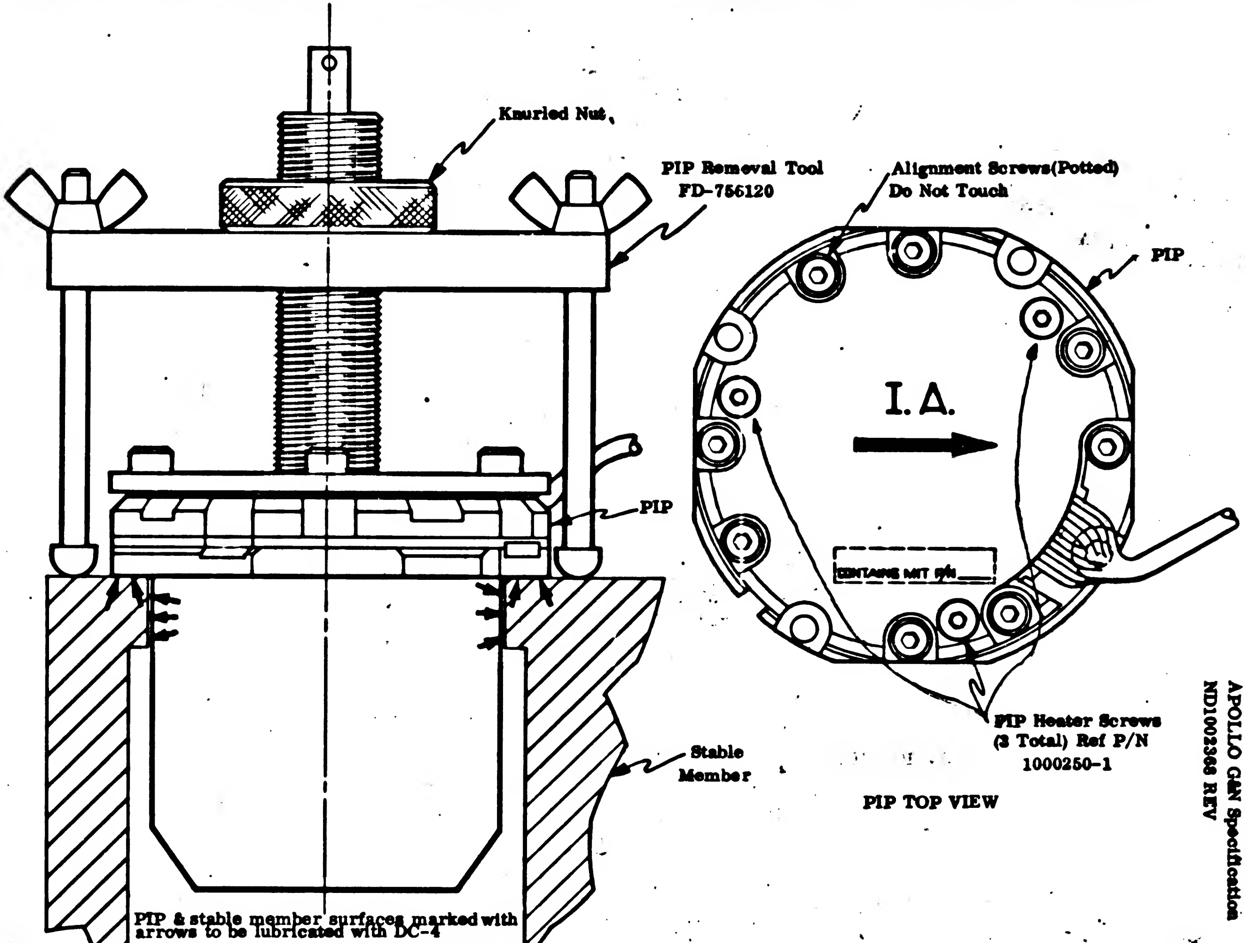
3.4.1.4.3 Screw Removal, MG Bearing Housings. Utilizing the access holes in the Middle Gimbal Axis Bearing Housings, see Figure 1, completely back out the six 6-32 Hex Socket Head Captive Screws (three on each end) that bolt the Middle Gimbal Axis Bearing Housings to the removable Half-Shell.

3.4.1.4.4 Shim Insertion, Half-Shell. Insert shims in the six slots in the removable Half-Shell and tape the shims to the Movable Hemisphere Assembly. These shims are positioned such as to prevent the screws from catching in their threaded holes when the Half-Shell is removed. See Figure 1 for Shim Insertion Technique TECHNIQUE.

3.4.1.4.5 Pull Tool Insertion, Hemisphere Assembly. Insert one puller tool, FB-770875, in each of the four tapped holes in the Movable Hemisphere Assembly.

3.4.1.4.6 Removal, Hemisphere Assembly. Exerting even force on each tool, remove the Movable Hemisphere Assembly and set it aside.

3.4.1.4.7 Removal, IRIG or PIP. Proceed with IRIG or PIP removal as required.



PIP TOP VIEW

PIP & stable member surfaces marked with arrows to be lubricated with DC-4

PIP & PIP REMOVAL TOOL (MOUNTED)

FIGURE 5

3.4.5 PIP Installation. PIP Installation shall be performed as follows. See Figure 7.

3.4.5.1 Inspection, Stable Member. Inspect the Stable Member PIP mounting surfaces for cleanliness under 3X minimum magnification and wipe with a lint-free cloth.

> NOTE: Steps 3.4.5.2 through 3.4.5.6 must be completed in a maximum of five minutes to maintain PIP temperatures within 120°F to 142°F.

3.4.5.2 Cleansing, PIP. Remove the PIP from a storage container, inspect for cleanliness under 3X minimum magnification and wipe with a lint-free cloth, especially the mounting surfaces. Weigh the replaced and the new PIP to the nearest gram and record in the log.

3.4.5.3 Inspection, PIP and Stable Member. Inspect the PIP and Stable Member for any evidence of nicks, scratches, burrs, etc., on mating surfaces, alignment pins, and pin slots.

3.4.5.4 Application, Heat Transfer Grease. Apply a thin film of Heat Transfer Grease (DC-4), P/N 1006879, to the mating surfaces of the PIP and Stable Member. See Figure 5.

3.4.5.5 Alignment, Mounting Ring Slot. Orient the PIP to align the slot in the mounting ring with the round alignment pin in the Stable Member, and the round hole in the mounting ring with the square pin on the Stable Member.

3.4.5.6 Insertion, PIP into Stable Member. Insert the PIP into the Stable Member, exercising extreme caution when engaging the PIP with its alignment pins to avoid bending the pins, cocking the PIP, or scoring the mating surface.

3.4.5.7 Insertion, Mounting Screws. Insert the four 4-40 mounting screws and screw, but do not tighten.

3.4.5.8 Torquing, Alternate Screws. Insure that the PIP has seated flush to the Stable Member surface (no leads caught under End Mount, alignment pin and slot seated, etc.), then torque alternate screws in one in-lb increments to a final torque of 6.50±0.35 inch-pounds.

3.4.5.9 Orientation, Suspension Module. Orient the Suspension Module in its proper attitude over the PIP.

3.4.5.10 Torquing, Alternate Screws. Tighten the three mounting screws finger tight. Torque alternate screws in one in-lb increments to a final torque of 6.50±0.35 in-lbs.

3.4.5.11 Removal, Dummy Sensor. Remove the Dummy Sensor from the PIP connector and connect the plug to the PIP Suspension Module.

3.4.5.12 Torque, Mounting Screws. Torque the connector mounting screws with a MTT1078 alternately in one turn increments to a final seating torque of 1.5±0.14 in.-lb.

3.4.5.13 Position and Secure, Harness. Place the harness in its proper position and secure, tightening any loosened cable clamp to 6.5±0.4 in.-lbs.

APOLLO G&N Specification
ND 1002378 Rev. A
Original Issue Date: 15 July 68
Release Authority: TDRR 36477
Class Release

OPERATIONAL PROCEDURES TO PRODUCE CORE ROPE WEAVER AND CORE ROPE TESTER TAPES

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				MIT	NASA
10/17/68	A	36917	1,2,25, 26 thru 32	FG	FG

This specification consists of pages 1 to 32 inclusive.

APPROVALS	S.L. Bachman 7/1/68 NASA/MSC	EC Hall 6/24/68 W Stameris 24 June 68 MIT/IL	6/24/68 RAY

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ND 1002378

CHECK SUM AND PARITY CHECK CERTIFICATION

Check sum and parity check have been successfully performed for the following:

Program Assembly Number 2021111-031

Module No.	Module Dash No.	Module Deck No.
B-1	2003972- 511	0257
B-2	2003972- 521	0258
B-3	2003972- 531	0259
B-4	2003972- 541	0260
B-5	2003972- 571	0263
B-6	2003972- 561	0262

NOTE: All data must be completed. Use N. A. where release does not contain a full set of modules.

Date ____________ Signature ____________________

NOTE: A copy of this certificate properly filled out and certified for the corresponding program release shall be inserted into the data package of each module along with a copy of the corresponding computer sum check sheet for each module as shown on pages 27 and sub.

APOLLO G&N Specification
ND 1002378 Rev. B
Original Issue Date: 1 July 68
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OPERATIONAL PROCEDURES TO PRODUCE CORE ROPE WEAVER AND CORE ROPE TESTER TAPES

Record of Revisions

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				MIT	NASA
10/17/68	A	36917	1,2,25, 26 thru 32	FG	FG
9/3/69	B	37756	1, 26	FG	FG

This specification consists of pages 1 to 32 inclusive.

APPROVALS	S.L. Bachman 7/1/68 NASA/MSC	EC Hall 6/24/68	W Stameris 24 June 68 MIT/IL	6/24/68 RAY

APOLLO G&N Specification
ND 1002378
Original Issue Date: 1 July 68
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Class Release

OPERATIONAL PROCEDURES TO PRODUCE CORE ROPE WEAVER AND CORE ROPE TESTER TAPES

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				MIT	NASA

This specification consists of pages 1 to 26 inclusive.

APPROVALS	7/1/68 NASA/MSC	EC Hall 6/24/68 24 June 68 MIT/IL	6/24/68 RAY

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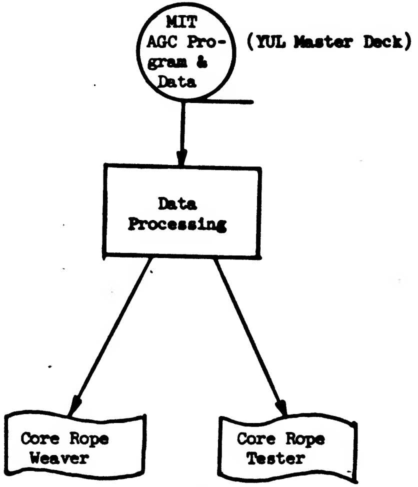
1. SCOPE

1.1 This document delineates the operational procedures necessary to produce the Core Rope Weaver and Core Rope Tester mylar punched tapes for the Apollo Guidance Computer fixed memory.

1.2 The Apollo Guidance Computer program which controls the Apollo Guidance and Navigation System must be wired into modules which make up the computer memory. The magnetic tape containing the Apollo Guidance Computer (AGC) program and data is supplied by MIT/IL-7. The same information is repeated on this tape four times, each as a distinct file. This program specifies the wiring of the core rope modules and is processed on an IBM 1401 computer. Outputs from this process are two punched mylar tapes: a Braid (Core Rope Weaver) tape and a checker (Core Rope Tester) tape.

The Braid tape actuates the Core Rope Winding machine which fabricates the woven memory of the AGC. This woven memory is processed in conjunction with the checker tape to verify the exactness of the fabrication. Any errors detected will cause the braid tape information to be corrected.

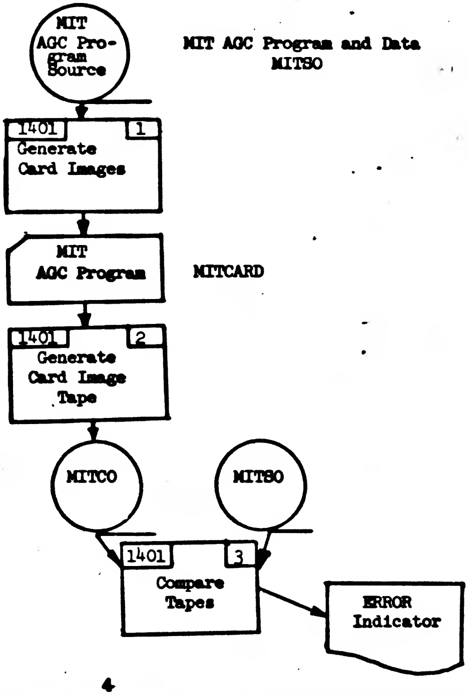
The minimum 1401 configuration requires 4K core memory, 2 tape drives, a paper tape reader/punch (1012), a card reader/punch, and a printer. A Tally machine (8-channel, comparer/duplicator) is used to produce mylar tape from the paper tape and to verify the duplication.



2. **PROCEDURE** - The procedures are described and flowcharted for each separable data processing function. Flowchart symbols are self-defining and the computer processing is identified by computer process sequence number and functional description. In the section entitled PROGRAMS USED the name of each program is associated with the numbered process.

2.1 Generation and Verification of Card Deck

2.1.1 Using the Card Image Program the AGC program data file is converted to an input card deck (MITCARD). Exact duplication is verified by reading these card images onto another tape (MITCO in illustration) and comparing this tape with the original MIT tape. If the tapes compare, the input procedure continues; if the tapes do not compare, the cards are created again from the original tape from a different file, the second tape is created, and compared with the original tape. If the tapes are not in agreement this process is repeated for a different file. If none of the files permits process 3 to succeed, the original tape (MITSO in illustration) is returned to MIT and they are requested to submit another program.

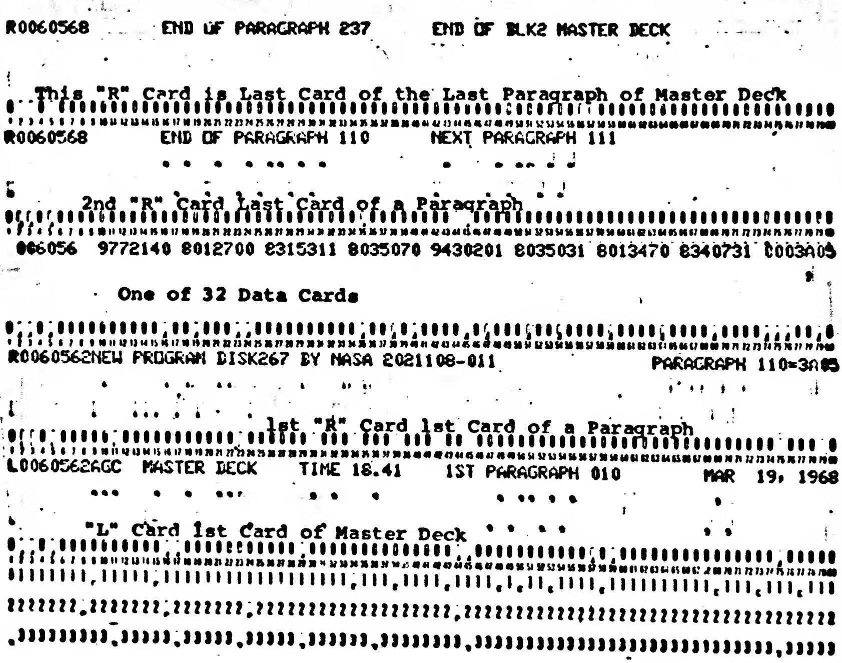


2.2 Deck Description

2.2.1 The first card of the program input deck is an "L" card (L in column 1) with hollerith information which identifies this particular flight plan. The "L" card is removed at this time and is held for use at other points in the procedure.

The flight plan consists of six modules; each module, having one side designated as "A" and one as "B", is composed of twenty-four paragraphs. Each paragraph is made up of thirty-four cards; the first card is a header card with an R in column 1 and contains the paragraph number and other identification. Each eight word data card contains the module number, module side (A or B), Strand (wire group) code number, and a sequence number 000_8-370_8).

In addition to flight plan identification, the end card (34th of the paragraph data) has an R in column 1, an 8 in column 8, and identifies the following paragraph. There must be an 8 in column 8 in order to terminate the current paragraph. There is a different "R" card at the end of the last paragraph to indicate the end of the master deck instead of the next paragraph.



R0060568 END OF PARAGRAPH 237 END OF BLK2 MASTER DECK

This "R" Card is Last Card of the Last Paragraph of Master Deck

R0060568 END OF PARAGRAPH 110 NEXT PARAGRAPH 111

2nd "R" Card Last Card of a Paragraph

006056 9772140 8012700 8315311 8035070 9430201 8035031 8013470 8340731 0003A05

One of 32 Data Cards

R0060562NEW PROGRAM DISK267 BY NASA 2021108-011 PARAGRAPH 110=3A05

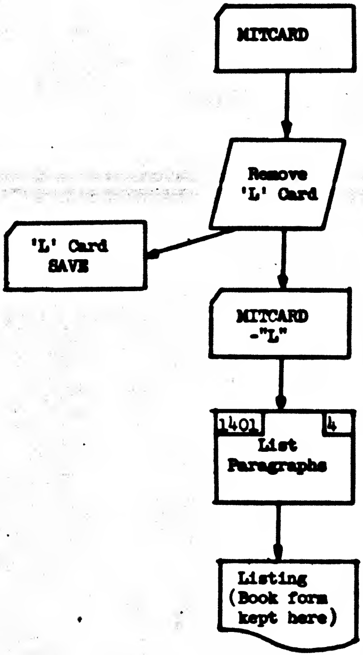
1st "R" Card 1st Card of a Paragraph

L0060562AGC MASTER DECK TIME 18.41 1ST PARAGRAPH 010 MAR 19, 1968

"L" Card 1st Card of Master Deck

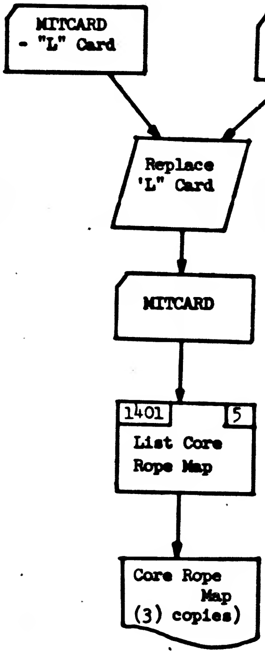
2.3 Paragraph Listing

2.3.1 The verified AGC program deck (MITCARD in illustration) is listed, (without the "L" card) on the 1401 computer and the resultant list is maintained by the contractor. This listing serves as a record of the paragraphs for the entire flight plan.



2.4 Core Rope Map

2.4.1 The "L" card is replaced in front of the MITCARD deck and processed on the 1401 with the Core Rope Map Listing program to produce three copies of the Core Rope Map. The map indicates where each wire of every paragraph is threaded.

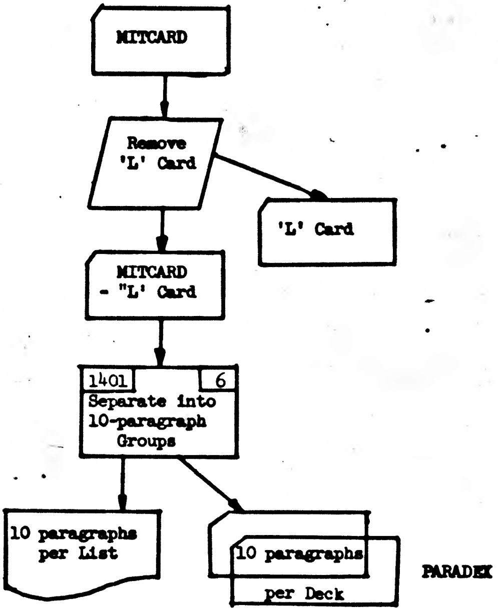


2.5 Core Rope Weaver - The Core Rope Weaver (CRW) is processed in the order as described in this procedure.

2.5.1 Paragraph Grouping

2.5.1.1 The Paragraph Counter program accepts as input the MITCARD deck, without the "L" card, and, utilizing a sense switch option, produces listings of ten paragraphs each. They are then read into the 1401 computer using the paragraph counter program in conjunction with the parameter card (see Page 15) in indicating the Weaver and date. Each page contains duplicate lists, one headed as "Paper", the other as "Mylar". These lists indicate the paragraph number, starting and ending wire numbers, module number and side, and the date the paragraph was run. These lists are used in conjunction with the Memory Assignment Map (See page 25) in identifying missing wires for preparation of the Dummy Wire Listing.

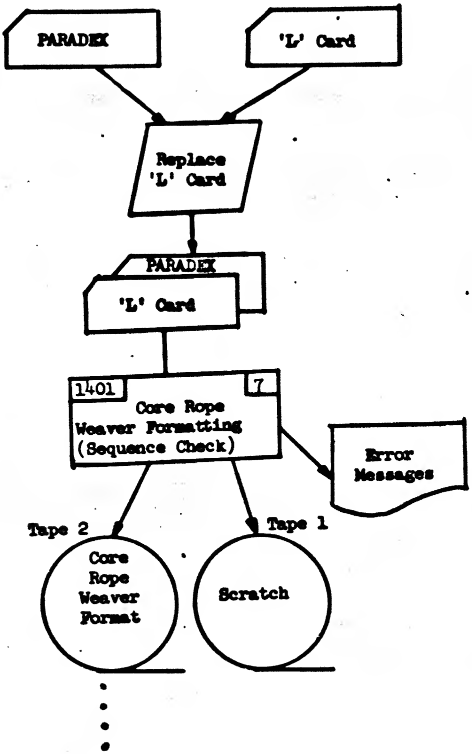
Concurrently with the ten-paragraph listing, the cards containing the data are manually separated into corresponding ten-paragraph groups (PARADEX on the illustration). The companion listing and card group are kept together until the Core Rope Weaver process is completed.



2.5.2 Core Rope Weaver Formatting

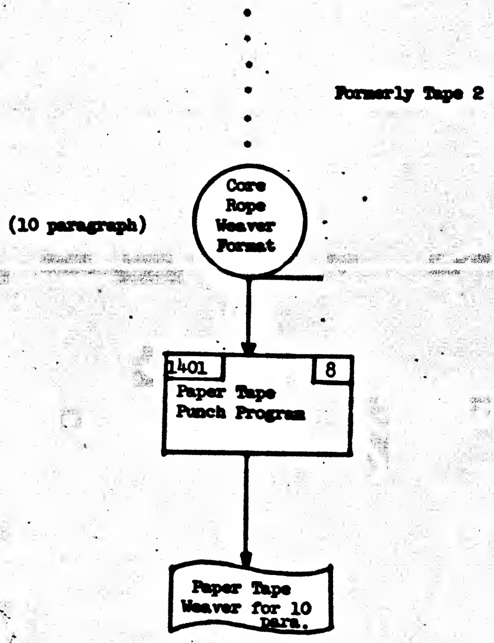
2.5.2.1 . The Core Rope Weaver program produces a properly formatted tape for later conversion into the Weaver punched paper tape. Each ten-paragraph card group, with the "L" card replaced, is input to the 1401 computer and produces a unit of output. Each unit of output is a ten-paragraph magnetic output tape. Proper sequencing of all cards within a program is verified in this process. This process requires the Core Rope Weaver program, one scratch tape, and an output tape.

If errors occur an error message is output indicating proper correction required.



2.5.3 Paper Punched Tape

2.5.3.1 . The magnetic output tapes, each containing ten paragraphs of data, are individually processed on the 1401, using the Paper Tape Punch Program (1012); to produce punched paper tapes.

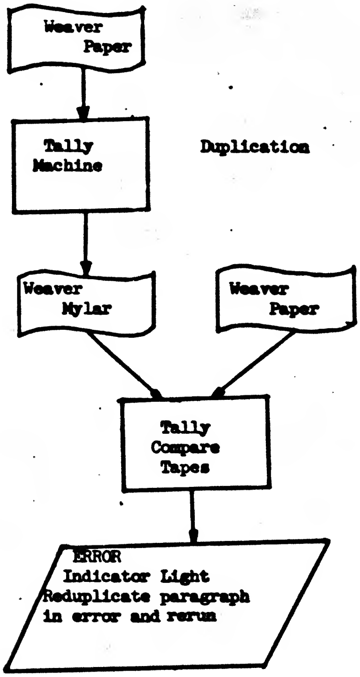


2.5.4 Mylar/Paper Tape Comparison

2.5.4.1 The paper tapes are now individually input to the Tally machine at which point they are rewound and then the Tally machine duplicates the tape data onto punched mylar tapes.

The Core Rope Weaver mylar tape and the paper tape are each read into the Tally machine and compared. This process winds the tapes backward(from end to start). The mylar tapes go onto a special core so that they may be mounted on the tape drives of the 1012 connected to the IBM 1401 computer.

As the tapes are read, should an error occur an Error Indicator light is lit and that paragraph must be removed and rerun.



BLOCK II FIXED MEMORY ASSIGNMENT

dule No.

e

STRAND (Wire Group)	1 A	1 B	2 A	2 B	3 A	3 B	4 A	4 B	5 A	5 B	6 A	6 B
01	1 00 020 16	1 00 021 16	1 06 050 16	1 06 051 16	1 14 100 16	1 14 101 16	1 22 130 16	1 22 131 16	1 30 160 16	1 30 161 16	1 36 210 16	1 36 211 16
02	17 00 022 32	17 00 023 32	17 06 052 32	17 06 053 32	17 14 102 32	17 14 103 32	17 22 132 32	17 22 133 32	17 30 162 32	17 30 163 32	17 36 212 32	17 36 213 32
03	33 01 024 48	33 01 025 48	33 07 054 48	33 07 055 48	33 15 104 48	33 15 105 48	33 23 134 48	33 23 135 48	33 31 164 48	33 31 165 48	33 37 214 48	33 37 215 48
04	49 01 026 64	49 01 027 64	49 07 056 64	49 07 057 64	49 15 106 64	49 15 107 64	49 23 136 64	49 23 137 64	49 31 166 64	49 31 167 64	49 37 216 64	49 37 217 64
05	65 02x 010 80	65 02x 011 80	65 10 060 80	65 10 061 80	65 16 110 80	65 16 111 80	65 24 140 80	65 24 141 80	65 32 170 80	65 32 171 80	65 30 220 80	65 30 221 80
06	81 02x 012 96	81 02x 013 96	81 10 062 96	81 10 063 96	81 16 112 96	81 16 113 96	81 24 142 96	81 24 143 96	81 32 172 96	81 32 173 96	81 30 222 96	81 30 223 96
07	97 03x 014 112	97 03x 015 112	97 11 064 112	97 11 065 112	97 17 114 112	97 17 115 112	97 25 144 112	97 25 145 112	97 33 174 112	97 33 175 112	97 31 224 112	97 31 225 112
08	113 03x 016 128	113 03x 017 128	113 11 066 128	113 11 067 128	113 17 116 128	113 17 117 128	113 25 146 128	113 25 147 128	113 33 176 128	113 33 177 128	113 31 226 128	113 31 227 128
09	129 04 040 144	129 04 041 144	129 12 070 144	129 12 071 144	129 20 120 144	129 20 121 144	129 26 150 144	129 26 151 144	129 34 200 144	129 34 201 144	129 32 230 144	129 32 231 144
10	145 04 042 160	145 04 043 160	145 12 072 160	145 12 073 160	145 20 122 160	145 20 123 160	145 26 152 160	145 26 153 160	145 34 202 160	145 34 203 160	145 32 232 160	145 32 233 160
11	161 05 044 176	161 05 045 176	161 13 074 176	13 075 176	161 21 124 176	161 21 125 176	161 27 154 176	161 27 155 176	161 35 204 176	161 35 205 176	161 33 234 176	161 33 235 176
12	177 05 046 192	177 05 047 192	177 13 076 192	177 13 077 192	177 21 126 192	177 21 127 192	177 27 156 192	177 27 157 192	177 35 206 192	177 35 207 192	177 33 236 192	177 33 237 192

Bank

Paragraph

Range of Sense Wires in Strand, Wire Group or Paragraph

X INDICATES BANKS ACCESSABLE AS FIXED-FIXED AS WELL AS BY BANK NUMBER

ND 1002378

CHECK SUM AND PARITY CHECK CERTIFICATION

Check sum and parity check have been successfully performed for the following:

Program Assembly Number ____________________

Module No.	**Module Dash No.**	**Module Deck No.**
B-1	**2003972-**________	________________
B-2	**2003972-**________	________________
B-3	**2003972-**________	________________
B-4	**2003972-**________	________________
B-5	**2003972-**________	________________
B-6	**2003972-**________	________________

NOTE: All data must be completed. Use N.A. where release does not contain a full set of modules.

Date ____________ **Signature** ____________________

6.2.9.21.5 Start tape reader.

6.2.9.21.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.22 Optics CDU Command Rate Test.

6.2.9.22.1 Set the G/N POWER - OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify OPTX BUS, 28V 800∿ 1% and 5% Power Supplies.

6.2.9.22.2 Set the OPTICS COUPLING switch on the G&N Panel to DIRECT. Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +5 degrees of zero as indicated by the TPAC (Telescope Trunnion Slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 20 seconds. Set the OPTICS ZERO switch to OFF. Set the OPTICS MODE switch to CMC.

6.2.9.22.3 Shaft Slew Rate Test.

6.2.9.22.3.1 Start tape reader.

6.2.9.22.3.2 In approximately 25 seconds VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 00018.88000 and 00011.32000.

6.2.9.22.4 Trunnion Slew Rate Test

6.2.9.22.4.1 Start tape reader.

6.2.9.22.4.2 In approximately 15 seconds VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 00004.71000 and 00002.83000.

6.2.9.23 Test Termination

6.2.9.23.1 Start tape reader.

6.2.9.23.2 On the GNIC Panel, set the OPTICS MODE switch to MAN. Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within 5 degrees of zero, as indicated by the TPAC (Telescope Trunnion Slaved to SXT).

6.2.9.23.3 Set the OPTICS ZERO switch to ZERO. Wait 20 seconds. Set the OPTICS MODE switch to CMC.

APOLLO G&N Specification
ND1002379 A
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Class A Release

POST INSTALLATION CHECKOUT PROCESS SPECIFICATION FOR THE APOLLO GUIDANCE & NAVIGATION SYSTEM BLOCK II-KSC WITH COLOSSUS FLIGHT ROPES

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				AC	NASA
9/5/68	A	36792	2, 10, 12, 22, 32, 40, 41, 43, 44, 53,	EA	WLS
			78, 93, 108, 109, 111, 122, 124-		
			126, 129		

This specification consists of page 1 to 130 inclusive.

APPROVALS	NOT REQUIRED CCA497-0274 **NASA/MSC**	**MIT/IL**	CCB 7/25/	**AC**

1.0 INTRODUCTION

1.1 The individual Spacecraft (SC) installed Guidance and Navigation (G&N) System to be checked out per this process specification shall consist of one of each of the following major assemblies: The applicable part numbers shall be determined by drawing No. 2014999.

1 - Optical Unit Assembly

1 - Navigation Base Assembly, Block II

1 - Inertial Measurement Unit (IMU) & PIPA Elect. Assy

1 - Power and Servo Assembly (PSA)

1 - Apollo Guidance Computer Group

1 - G&N Interconnect Harness Assembly

1 - Signal Conditioner Assembly

1 - Display and Control Group (D & C)

1 - Coupling Data Unit

1.2 The G&N System herein shall be identified as a Block II system. The computer contains the program flight ropes in the core rope memory. The test requirements herein are based on Colossus Rev. 237 flight ropes.

2.0 SCOPE

2.1 This specification outlines the checkout requirements for the G&N System installed in the Apollo Command Module Spacecrafts and tested in the VAB, MSOB, or on the PAD.

2.2 This document is to be used as technical support for all Block II G&N System test documentation for Command Module spacecraft testing. This document shall be amended by addendum to support applicable hardware, mission or program differences.

6.2.2 CMC Operational Test

NOTE: Verify that IMU STANDBY power (including CMC operate power) is applied, IMU OPERATE Power is not applied. (G&N IMU HTR MN A and MN B breakers engaged, Computer MN A and MN B breakers engaged, IMU MN A and MN B breakers disengaged, G/N Power-IMU switch on LEB Lighting Control Panel in OFF Position).

6.2.2.1 CMC Self-Check.

6.2.2.1.1 On K-148, enter the following:

VERB 36 ENTR . Wait 10 seconds. [illegible]

6.2.2.1.2 Verify K-START tape F09C103-K10538-XXCM Self-Check Test is on the K-START tape reader, where XX is the tape revision number.

6.2.2.1.3 Start tape reader.

6.2.2.1.4 When tape reader stops, verify the following on the CRT DSKY display:

R1 = +09237
R2 = +10538 (tape number)
R3 = -000XX (tape revision number)

6.2.2.1.5 Load E-Memory Program.

6.2.2.1.5.1 Start tape reader.

6.2.2.1.5.2 When tape reader stops, verify R1 displays +00101.

6.2.2.1.6 Initiate Self-Check

6.2.2.1.6.1 Start tape reader.

6.2.2.1.6.2 When R3 = 00002, start tape reader.

6.2.2.1.6.3 When tape reader stops, wait 30 seconds.

6.2.2.2 DSKY Check.

6.2.2.2.1 Start tape reader.

6.2.2.2.2 All the electroluminescent elements (PROG, VERB, NOUN, and Row 1, Row 2, Row 3) shall display the decimal number nine (9). Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's

6.2.3.1.6 (continued)

c. On the CRT, verify the absence of the +120 VDC PIPA supply (CG 1040) for a period of 90±10 seconds following power application in 6.2.3.1.5. Verify PIPA fail discrete is present during this period. After approximately 100 seconds, the voltage shall read +120±6 Vdc.

d. Stop the analog recorders.

6.2.3.1.7 Insure that the following alarm lamps are not lighted on G&N LEB Display Panel.

a. CMC Warning
b. ISS Warning
c. PGNS Caution

6.2.3.1.8 Verify that the PROG alarm lamp on the DSKY's does not light.

6.2.3.1.9 The OG, IG, and MG CDU angles shall be 00000±00150. Verify on CRT.

6.2.3.1.10 Enter the following into K-148:

a. VERB 41 NOUN 20, ENTER
b. +00000, ENTER
c. +00000, ENTER
d. +00000, ENTER

6.2.3.1.11 Verify that the following secondary power supply voltages are not flashing on the CRT display.

SECONDARY POWER SUPPLY VOLTAGES

Meas. No.	Signal
1. CG 1041	+120 VDC PIPA SUPPLY
2. CG 1051	+20 VDC PIPA SUPPLY
3. CG 1052	-20 VDC PIPA SUPPLY
4. CG 1070	+4 VDC CDU SUPPLY
5. CG 1100	-28 VDC ELECTRONICS
6. CG 1021	+14 VDC CMC SUPPLY
7. CG 1030	+4 VDC CMC SUPPLY
8. CG 1201	IMU 28V 800 CPS 1 pct 0 ph
9. CG 1202	IMU 28V 800 CPS 5 pct ph A (-90°)
10. CG 1203	IMU 28V 800 CPS 5 pct ph B (0°)
11. CG 1331	3.2 KC 28V SUPPLY
12. CG 1110	2.5 VDC TM BIAS

6.2.3.1.12 The IMU Platform should not be moved during the Temperature Control Tests. 15 minutes after the application of IMU OPERATE power record PIPA TEMP (CG 2300) displayed on the CRT.

6.2.5.1.3.1 (continued)

VERB 21 NOUN 01 ENTR
01036 ENTR
40000 ENTR

Verify that NO ATT indication is OFF.

6.2.5.1.4 Set the G&N Power AC1-OFF-AC2 Switch on the Right Hand Circuit breaker panel to OFF and the G&N POWER AC1 and AC2 circuit breakers to OFF (breakers pulled out).

6.2.5.1.5 Decrease the LIGHTS - NUMERICS controls on both the Left Hand Circuit Breaker panel and the LEB Lighting Control Panel to the minimum brightness - OFF position.

6.2.5.1.6 Set the PSAAM power switch on the PSAAM to OFF.

6.2.5.1.7 Set the IMU HTR MN A and MN B circuit breaker on the Right Hand Circuit Breaker panel to OFF (breakers pulled out).

6.2.5.1.8 Set the G/N POWER - OPTICS switch on the LEB Lighting Control Panel to OFF and G&N OPTICS MN A and MN B breakers on the Right Hand Circuit breaker panel to OFF.

6.2.5.1.9 Set the COMPUTER MN A and MN B Circuit breakers on the Right Hand Circuit Breaker panel to OFF (breakers pulled out).

6.2.5.1.10 Verify that the PTC is supplying inertial components heater power to the G&N System. This will be indicated by the following on the PTC.

a. G&N ON (PTC inhibit) light not illuminated.
b. IMU Temp/heater current meter indicates IMU temperature of 130° ±5°F.

6.2.5.2 Turn ON Procedure

6.2.5.2.1 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set or verify the following G&N Indicator Control Panel switches to the position indicated.

a. CONDITION LAMPS to ON
b. OPTICS ZERO to ZERO
c. OPTICS MODE to MANUAL
d. OPTICS COUPLING to DIRECT
e. OPTICS SPEED to LO
f. OPTICS TEL TRUN to SLAVE to SXT
g. RETICLE BRIGHTNESS to minimum brightness position.

6.2.5.2.2 Insure that interfacing system EPS and ECS are turned on and operating properly.

CAUTION: The remaining procedure must be followed in sequence specified. Failure to adhere to this sequence may require recalibration of the inertial components.

6.2.5.2.3 Energize the G&N COMPUTER MN A and MN B breakers on the Right Hand Circuit Breaker panel (breakers pushed in). Press the STBY pushbutton on the DSKY for approximately 3 seconds. Verify +14 and +4 VDC AGC power supply outputs on CRT display. Voltages shall be +14±0.4V (CG 1020) and +4±0.2 (CG1030). On DSKY verify TEMP light is ON.

6.2.5.2.4 Set the G&N POWER AC1 and AC2 breakers on the Right Hand Circuit Breaker Panel to ON (breakers pushed in). Set the G&N POWER AC1-OFF-AC2 switch to AC1.

6.2.5.2.4.1 Set the G&N DSKY and Display Panel brightness to the minimum acceptable level by manipulation of LIGHTS - NUMERICS control on both Left Hand Circuit breaker panel and LEB Lighting Control panel.

6.2.5.2.5 Energize the G&N IMU HTR, MN A and MN B breakers on the Right Hand Circuit Breaker panel (breakers pushed in). Insure that the CMC +28 VDC discrete lamp on the Event Module is illuminated (CG 1523). Verify TEMP light on DSKY is extinguished.

6.2.5.2.5.1 Set/Verify the following switches on the PSAAM.

a. PSAAM PWR to ON
b. INHIBIT VOLTAGE FAIL to OFF.

6.2.5.2.6 Enter VERB 36 ENTER into K148. Press ERROR RESET pushbutton on K148. All computer alarms on the Main Display Console (MDC) and LEB AGC DSKY shall clear. Verify that DSKY R1, R2, R3, VERB, NOUN and PROG indications are blank.

6.2.5.2.7 Verify K-START tape F09C103-K10538-XXCM Self-Check Test is on the K-START tape reader, where XX is the tape revision number.

6.2.5.2.8 Start tape reader.

6.2.5.2.9 When tape reader stops, verify the following on the CRT DSKY display:

R1 = +69237
R2 = +10538 (Tape number)
R3 = +000XX (tape revision number)

6.2.5.2.10 Start tape reader.

6.2.5.2.17 Verify that the PROG alarm lamp on the DSKY's does not light.

6.2.5.2.18 Enter VERB 40, NOUN 20, ENTER into K148. Wait 15 seconds.

6.2.5.2.19 On K-148 enter the following

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.5.2.20 Set the G&N OPTICS MN A and MN B circuit breakers on the Right Hand Circuit breaker panel to the ON position (breaker pushed in).

6.2.5.2.21 Verify that the CRT indications of the signals in table below are not flashing.

Table V. Secondary Power Supply Voltages

	Measurement Number	Signal
1.	CG 1040	+120 VDC PIPA SUPPLY
2.	CG 1051	+20 VDC PIPA SUPPLY
3.	CG 1052	-20 VDC PIPA SUPPLY
4.	CG 1070	+4 VDC CDU SUPPLY
5.	CG 1100	-28 VDC ELECTRONICS
6.	CG 1020	+14 VDC CMC SUPPLY
7.	CG 1030	+4 VDC CMC SUPPLY
8.	CG 1201	IMU 28V 800 CPS 1 pct 0 pha
9.	CG 1202	IMU 28V 800 CPS 5 pct ph A
10.	CG 1203	IMU 28V 800 CPS 5 pct ph B
11.	CG 1331	3.2 KC 28V SUPPLY
12.	CG 1110	2.5 VDC TM BIAS
[illegible]	[illegible]	[illegible]

6.2.5.2.22 Monitor the PIPA Display Scope to insure that each PIPA is moding properly.

6.2.5.2.23 Perform 6.2.6 G&N Operational Test.

6.2.6 **G&N Operational Test**

6.2.6.1 Verify K-START tape F09C103-K10531-XXCM G/N OPCHK is on K-START tape reader, where XX is the tape revision number.

6.2.6.1.1 Start tape reader.

6.2.6.1.2 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = +09237
b. R2 = +10531 (tape number)
c. R3 = -006XX (tape revision number)

6.2.6.2 E-Memory Program Load and Sum Check.

6.2.6.2.1 Start tape reader.

6.2.6.2.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00101.

6.2.6.3 Local g Measurement.

6.2.6.3.1 Start tape reader.

6.2.6.3.2 In approximately 10 minutes, VERB 06 NOUN 98 shall flash.

6.2.6.3.3 From the CRT DSKY display read and record Row 1 and Row 2 (local gravity whole and fractional, respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.2.6.4 Horizontal Earth Rate Measurement.

6.2.6.4.1 Press PRO pushbutton on DSKY.

6.2.6.4.2 In approximately 2 seconds VERB 06 NOUN 96 shall flash. From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.2.6.5 Enter the following on K-148:

VERB 34	ENTR
VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR

6.2.9 Semi-Automatic Mode Test

6.2.9.1 Verify K-START Tape F09C103-K10530-XXCM Semi-Automatic Mode Test is on K-START tape reader, where XX is the tape revision number.

6.2.9.1.1 Start tape reader.

6.2.9.1.2 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = +02237
b. R2 = +10530 (tape number)
c. R3 = -000XX (tape revision number)

6.2.9.2 E-Memory Program Load

6.2.9.2.1 Start tape reader.

6.2.9.2.2 When tape reader stops verify the following on CRT DSKY:

R1 = 00101

6.2.9.3 Command Accuracy 0°.

6.2.9.3.1 Start tape reader

6.2.9.3.2 When tape stops verify that CRT DSKY R1 indicates 00201. Wait 15 seconds.

6.2.9.3.3 Read and record CRT IMU Gimbal angles. The indications shall be 000±003 degrees.

6.2.9.3.4 Read and record CRT CDU angle indications. The indications shall be +000.00±001.50.

6.2.9.4 Command Accuracy 45°.

6.2.9.4.1 Start tape reader.

6.2.9.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00301. Wait 5 seconds.

6.2.9.4.3 Read and record CRT IMU Gimbal angles. The indications shall be 045±003 degrees.

6.2.9.4.4 Read and record CRT CDU angle indications. Indications shall be +045.00±001.50.

6.2.9.5 CDU Repeating Accuracy 45°.

6.2.15 IRIG Scale Factor Test

6.2.15.1 Verify K-START Tape F09C103-K00083-XX IRIG Scale Factor Test is on the K-START tape reader, where XX is the tape revision number.

6.2.15.2 Start tape reader.

6.2.15.2.1 When tape reader stops verify the following on the CRT DSKY display:

a. R1 = +09237
b. R2 = +00083 (tape number)
c. R3 = -000XX (tape revision number)

6.2.15.2.2 Start tape reader.

6.2.15.2.3 When tape reader stops, wait 20 seconds.

6.2.15.3 E-Memory Program Load.

6.2.15.3.1 Start tape reader.

6.2.15.3.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00000.

6.2.15.4 Test Position Data Load (+X Scale Factor)

6.2.15.4.1 Start tape reader.

6.2.15.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.2.15.4.3 Start tape reader

6.2.15.4.4 When tape reader stops, VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nave Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.4.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.4.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001).

6.2.16 IMU Performance Test. A reference data sheet is provided at the end of this section to aid in data reduction.

6.2.16.1 Insure that IMU Operate power and LGC Operate power has been supplied for a minimum of one hour and that the IMU is not in a Gimbal Lock condition.

6.2.16.2 On CRT, monitor and record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.2.16.3 Verify K-START Tape F09C103-K90081-XX IMU Performance that is on the tape reader; where XX is the tape revision number.

6.2.16.4 Start tape reader.

6.2.16.4.1 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = +09237
b. R2 = +00081 (tape number)
c. R3 = -000XX (tape revision number)

6.2.16.4.2 Start tape reader.

6.2.16.4.3 When tape reader stops, wait 10 seconds.

6.2.16.5 Start the tape reader. After 15 seconds, verify IMU is coarse aligned to zero degrees.

6.2.16.6 E-Memory Program Load.

6.2.16.6.1 Start the tape reader. When tape reader stops, verify the following DSKY display:

Row 1
Row 3

6.2.16.7 Test Position +00001.

6.2.16.7.1 E-Memory Program and Test Position Matrix Sum Check

6.2.16.7.1.1 Start tape reader.

6.2.16.7.1.2 When tape reader stops, verify DSKY Row 1 displays +00001.

6.2.16.22.1 **Y PIPA Data Correction Calculation.**

6.2.16.22.1.1 From the uplink file tape, the compressed data tape or the PCM tape, request a data reduction of the X and Z accelerometer ΔV counts (addresses 37 and 41, respectively) and the TIME 2 and TIME 1 registers (addresses 24 and 25, respectively) for the period during which the Y PIPA test was being performed in Positions 5 and 6 of the IMU Performance Test.

6.2.16.22.1.2 Perform the following calculations for Position 5.

$G'_5 = (G_5/\text{Cos } \theta y_5)$

where:

G_5 = Measured acceleration term (line 1)

G'_5 = Corrected acceleration term

$\text{Cos } \theta y_5 = 1 - (\theta^2 y_5/2)$ for small angles

$\theta y_5 = \sqrt{\theta^2{}_{x5} + \theta^2{}_{z5}}$

and:

$\theta_{z5} = (\Delta V_{x5} - \Delta V_x \text{ Bias}) (\text{S.F.}_x)/(\Delta T) (\text{local } g)$

$\theta_{x5} = (\Delta V_{z5} - \Delta V_z \text{ Bias}) (\text{S.F.}_z)/(\Delta T) (\text{local } g)$

and:

$\Delta V_x \text{ Bias} = (\text{X PIPA Bias}) (\Delta T)/\text{S.F.}_x$

$\Delta V_z \text{ Bias} = (\text{Z PIPA Bias}) (\Delta T)/\text{S.F.}_z$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.2.16.22.1.3 Perform the following calculations for Position 6.

$G'_6 = (G_6/\text{Cos}\ \theta y_6)$

where:

G_6 = Measured acceleration term (line [illegible])

G'_6 = Corrected acceleration term

$\text{Cos}\ \theta y_6 = 1 - (\theta^2 y_6/2)$ for small angles

$\theta y_6 = \sqrt{\theta^2{}_{x6} + \theta^2{}_{z6}}$

and:

$\theta_{x6} = (\Delta V_{x6} - \Delta V_x \text{ Bias})\ (\text{S.F.}_x)\ /\ (\Delta T)\ (\text{local } g)$

$\theta_{z6} = (\Delta V_{z6} - \Delta V_z \text{ Bias})\ (\text{S.F.}_z)\ /\ (\Delta T)\ (\text{local } g)$

and:

$\Delta V_x \text{ Bias} = (\text{X PIPA Bias})\ (\Delta T)/\text{S.F.}_x$

$\Delta V_z \text{ Bias} = (\text{Z PIPA Bias})\ (\Delta T)/\text{S.F.}_z$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.2.16.22.2 Obtain data from last IRIG and/or PIPA Test and fill in Data Sheet x_{i-1}.

6.2.16.22.3 Obtain data from second last IRIG and/or PIPA Test and fill in Data Sheet x_{i-2}.

6.2.16.22.4 Obtain data from third last IRIG and/or PIPA Test and fill in Data Sheet x_{i-3}.

DATA SHEET

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.2.16. 7.4.3	+N BDY - ADOAY Position +00001	meru/g	( )___.__	a
6.2.16. 8.4.3	+N BDZ - ADOAZ Position +00002	meru/g	( )___.__	b
6.2.16. 8.5.2	-X PIPA Test Position +00002	cm/sec^2	( ) 0 0___. ( )_____	c
6.2.16. 8.6.2	-N BDX + ADIAX Position +00002	meru/g	( )___.__	d
6.2.16. 9.4.3	+N BDX - ADOAX Position +00003	meru/g	( )___.__	e
6.2.16. 10.4.3	+N BDY + ADSRAY Position +00004	meru/g	( )___.__	f
6.2.16. 10.5.2	-Z PIPA Test Position +00004	cm/sec^2	( ) 0 0___. ( )_____	g
6.2.16. 10.6.2	+N BDZ + ADIAZ Position +00004	meru/g	( )___.__	h
6.2.16 11.4.3	+Y PIPA Test Position +00005	cm/sec^2	( ) 0 0___. ( )_____	i

6.2.18.4.8 Verify the data appearing in R1 and R2 and if correct, perform the following sequence:

a. VERB 24, ENTER
b. +XXX.XX, ENTER (Target 2 azimuth)
c. ±XX.XXX, ENTER (Target 2 elevation)

6.2.18.4.9 After the correct readings for R1 and R2 are verified, enter VERB 33, ENTER into the DSKY.

6.2.18.4.10 Using the Optics Hand Controller; align the SXT StLOS to Target 1 and press MARK pushbutton. If satisfied that the MARK was good, press the ENTER pushbutton. If not satisfied with MARK, press MARK REJECT pushbutton and repeat this step.

6.2.18.4.11 Set the OPTICS SPEED switch to HI. Using the Optics Hand Controller, drive the SXT StLOS to the approximate position of Target 2.

6.2.18.4.12 Set the OPTICS SPEED switch to LO. Using the Optics Hand Controller, align the SXT StLOS to Target 2 and press the MARK pushbutton. If satisfied that the MARK was good, press the ENTER pushbutton. If not satisfied, press the MARK REJECT pushbutton and repeat this step.

6.2.18.4.13 On the DSKY, observe the following data displayed:

a. VERB 06 NOUN 93
b. R1 = ±XX.XXX (X gyro elevation error, deg.)
c. R2 = ±XX.XXX (Y gyro elevation error, deg.)
d. R3 = ±XX.XXX (Z gyro azimuth error, deg.)

Record R1, R2 and R3. The X and Y gyro elevation error shall be 0.00±0.55 degrees and the Z gyro azimuth error shall be 0.00±0.3 degrees.

6.2.18.4.14 Enter VERB 34 ENTR. Observe the PROG display on the DSKY to change to 02. Immediately repeat steps 6.2.18.4.2 through 6.2.18.4.13 twice.

6.2.18.4.15 Repeat Steps 6.2.18.4.2 through 6.2.18.4.13 at 150, 180 and 210 minutes from T_0.

6.2.18.4.16 Enter VERB 36, ENTER into the DSKY.

6.2.18.4.17 Enter VERB 41 NOUN 20, ENTER into the DSKY. Enter +00000, ENTER into the DSKY three times. Set the G&N POWER OPTICS switch on the LEB Lighting Control Panel to OFF.

6.2.18.5 Gyro Compassing Stability

6.2.18.5.1 Calculate the average of the first three X and Y gyro elevation errors and the first three Z gyro azimuth errors.

6.2.19 CMC Voltage Margin Test

6.2.19.1 Verify that the G&N IMU HTR MNA & MNB circuit breakers are engaged, Computer MNA & MNB breakers are engaged, IMU MNA & MNB circuit breakers are not engaged, and the G&N Power - IMU switch on the LEB Lighting Control Panel is in the OFF position.

6.2.19.2 On the PSA Adapter Module set the INHIBIT VOLTAGE FAIL switch to ON.

CAUTION: During the performance of this test the +4 VDC CMC Power Supply shall not be operated at less than +2.5 VDC or greater than 5.2 VDC (CG 1030). The +14 VDC CMC Power Supply shall not be operated at less than +8.5 VDC or greater than +17.0 VDC (CG 1020). Rotate the LEB LTS NUMERICS SEL to approximately center position. Decrease to absolute minimum discernable lighting.

NOTE: The flashing indication of the CMC Power Supplies on CRT may be disregarded for this test.

6.2.19.3 Into R154 insert 0001. Verify and execute.

6.2.19.3.1 Into R153 insert 1100. Verify and execute.

6.2.19.4 Into C156 insert -040001244. Verify and execute. Verify on the CRT that GV0116 is between -3.0 and -5.0 VDC.

6.2.19.5 Into C156 insert -050001234. Verify and execute. Verify on the CRT that GV0106 is between -4.0 and -6.0 VDC.

6.2.19.6 Into R154 insert 0111. Verify and execute.

6.2.19.7 Observe CG 1020, +14 VDC CMC Power Supply and CG 1030, +4 VDC CMC Power Supply, on the CRT. Repeat 6.2.19.3 through 6.2.19.6 adjusting each C-Start entry until CG 1020 is +12.1 (+0.1, -0.0) VDC and CG 1030 is +3.40 (+0.03 - 0.00) VDC.

6.2.19.8 On K-148, enter the following:

VERB 36 ENTR Wait 10 seconds.

6.2.19.9 Verify K-START tape F09C103-K10538-XX CM Self-Check Test is on the K-START tape reader, where XX is the tape revision number.

6.2.19.9.1 Start tape reader.

6.2.19.9.2 When tape reader stops, verify the following on the CRT DSKY display

R1 = +09237
R2 = +10538 (tape number)
R3 = -000XX (tape revision number)

6.2.19.10 Load E-Memory Program.

6.2.19.10.1 Start tape reader.

6.2.19.10.2 When tape reader stops, verify:

R1 = 00101.

6.2.19.11 Initiate Self-Check.

6.2.19.11.1 Start tape reader.

6.2.19.11.2 Wait until R3 = 00002. Verify RESTART lamp on DSKY is not lit.

6.2.19.12 Into R154 insert 0101. Verify and execute.

6.2.19.13 Set the INHIBIT VOLTAGE FAIL switch on the PSAAM to OFF. Verify the RESTART lamp on the DSKY is lit. Disregard other DSKY indications. If RESTART does not light, repeat 6.2.19.3. Verify CMC Warning master alarms are lit.

6.2.19.14 Set the INHIBIT VOLTAGE FAIL switch to ON.

6.2.19.15 Into R154 insert 0001. Verify and execute.

6.2.19.16 Into C156 insert +108001244. Verify and execute. Verify on the CRT that GV0116 is between +9.8 and +11.8 VDC.

6.2.19.17 Into R154 insert 0111. Verify and execute.

6.2.19.18 Observe CG 1020, +14 VDC CMC Power Supply on the CRT. Repeat 6.2.19.15 through 6.2.19.17 adjusting the C-Start entry until CG 1020 is 16.4 (+0.1, -0.0) VDC. Press ERR RST on K-148.

6.2.19.19 Initiate Self-Check.

6.2.19.19.1 Return K-START tape to its previous stop.

6.2.19.19.2 Start tape reader.

6.2.19.19.3 Wait until R3 = 00002. Verify RESTART lamp on DSKY is not lit.

6.2.19.20. Into R154 insert 0011. Verify and execute.

6.2.19.21 Set the INHIBIT VOLTAGE FAIL switch on the PSAAM to OFF. Verify that the DSKY RESTART lamp is lit. Disregard other DSKY indications. Verify CMC Warning master alarms are lit.

6.2.19.22 Set INHIBIT VOLTAGE FAIL switch on PSAAM to ON.

6.2.19.23 Into R154 insert 0001. Verify and execute.

6.2.19.24 Into C156 enter +092001234. Verify and execute. Verify on the CRT that GV0106 is between +8.2 and +10.2 VDC.

6.2.19.25 Into R156 insert 0111. Verify and execute.

6.2.19.26 Observe CG 1030, +4 VDC CMC Power Supply on the CRT. Repeat 6.2.19.23 through 6.2.19.25 adjusting the C-Start entry until CG 1030 is +4.60 (+0.08, -0.08) VDC. Press ERR RST on K-148.

6.2.19.27 Initiate Self-Check.

6.2.19.27.1 Return K-START tape to its previous stop.

6.2.19.27.2 Start tape reader.

6.2.19.27.3 Wait until R3 = 00002. Verify RESTART lamp on DSKY is not lit.

6.2.19.28 Into R154 insert 0101. Verify and execute.

6.2.19.29 Set the INHIBIT VOLTAGE FAIL switch on the PSAAM to OFF. Verify that the DSKY RESTART lamp is lit. Verify CMC Warning master alarms are lit.

6.2.19.30 Set the INHIBIT VOLTAGE FAIL switch on the PSAAM to ON.

6.2.19.31 Into R154 insert 0001. Verify and execute.

6.2.19.32 Into C156 insert -040001244. Verify and execute. Verify on the CRT that GV0116 is between -3.0 and -5.0 VDC.

6.2.19.33 Into R154 insert 0111. Verify and execute.

6.2.19.34 Observe CG 1020, +14 VDC CMC Power Supply on the CRT. Repeat 6.2.19.31 through 6.2.19.33 adjusting the C-Start entry until CG 1020 is +12.1 (+0.1, -0.0) VDC. Press ERR RST on K148.

6.2.19.35 Initiate Self-Check.

6.2.19.35.1 Return K-START tape to its previous stop.

6.2.19.35.2 Start tape reader.

6.2.19.35.3 Wait until R3 = 00002. Verify RESTART lamp on the DSKY is not lit.

APPENDIX I (Continued)

Signal	Link	Nomenclature	G&N Test Requirements	PSAAM and/or SCA Uncertainty % of Full Scale
CG 2138	1	MG SERVO ERROR QUAD	0.0±1.2 VRMS	3.6%
CG 2142	2	MG 1X RESOLVER O/P SIN	18.38±1.84 VRMS @ 45°	2.5%
CG 2143	2	MG 1X RESOLVER O/P COS	18.38±1.84 VRMS @ 45°	2.5%
CG 2147	2	MG SERVO ERROR IN PHASE	0.0±60 mv rms @ null	1.4%
CG 2150	1	MG TORQUE MOTOR CURRENT	0.125 amp max during Fine Align Torquing	0%
CG 2168	1	OG SERVO ERROR QUAD	0.0±1.2 VRMS	3.6%
CG 2172	2	OG 1X RESOLVER O/P SIN	18.38±1.84 VRMS @ 45°	2.5%
CG 2173	2	OG 1X RESOLVER O/P COS	18.38±1.84 VRMS @ 45°	2.5%
CG 2177	2	OG SERVO ERROR IN PHASE	0.0±60 mv RMS @ null	1.4%
CG 2180	1	OG TORQUE MOTOR CURRENT	0.125 amp max during Fine Align Torquing	0%
CG 2219	1	PITCH ATT ERROR-CDU DAC O/P	5.06±0.5 VRMS @ 17°	0.67%
CG 2220	1	IG CDU FINE ERROR	0.0±0.07 VRMS @ null	0.29%
CG 2221	1	IG CDU COARSE ERROR	0.0±0.68 VRMS at null	0.29%
CG 2249	1	YAW ATT ERROR-CDU DAC O/P	5.06±0.5 VRMS at 17°	0.67%
CG 2250	1	MG CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 2251	1	MG CDU COARSE ERROR	0.0±0.68 VRMS at null	0.29%
CG 2279	1	ROLL ATT ERROR-CDU DAC O/P	5.06±0.5 VRMS at 17°	0.67%
CG 2280	1	OG CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 2281	1	OG CDU COARSE ERROR	0.0±0.68 VRMS	0.29%
CG 2300	2	PIPA TEMPERATURE	130.5±1.5°F Operate Mode	2%
CG 3011	1	TRUNNION CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 3021	1	SHAFT CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 3117	1	SXT SHAFT SERVO ERROR IN PH	-0.25 to -2.00 VRMS at Hi Rate	1.1%
CG 3118	1	SXT TRUNNION SERVO ERROR IN PH	-0.25 to -2.00 VRMS at Hi Rate	1.1%
CG 3140	1	SXT SHAFT TACH O/P	3.3±1.3 VRMS at Hi Rate	1.1%
CG 3145	1	SXT SHAFT MTR CONTROL WINDING	+0.5 to 4.00 VRMS at Med Rate	1.1%
CG 3150	1	SXT TRUNNION TACH O/P	3.3±1.3 VRMS at Hi Rate	1.1%
CG 3155	1	SXT TRUNNION MTR CONTROL WINDING	+0.25 to +2.00 VRMS at Med Rate	1.1%

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APOLLO G&N Specification
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POST INSTALLATION CHECKOUT PROCESS SPECIFICATION FOR THE APOLLO GUIDANCE & NAVIGATION SYSTEM BLOCK II-KSC WITH COLOSSUS FLIGHT ROPES

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				AC	NASA
9/5/68	A	36792	2, 10, 12, 22, 32, 40, 41, 43, 44, 53,	EA	WLS
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			126, 129		
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			52, 55, 56, 57, 59, 117, 121, 122, 123		

This specification consists of page 1 to 130 inclusive.

APPROVALS	NOT REQUIRED CCA 497-0274 **NASA/MSC**	**MIT/IL**	CCB 7/25/68	**AC**

1.0 INTRODUCTION

1.1 The individual Spacecraft (SC) installed Guidance and Navigation (G&N) System to be checked out per this process specification shall consist of one of each of the following major assemblies: The test requirements herein are based on COLOSSUS Rev. 237 and COLOSSUS Rev. 249 flight ropes.

1 - Optical Unit Assembly

1 - Navigation Base Assembly, Block II

1 - Inertial Measurement Unit (IMU) & PIPA Elect. Assy

1 - Power and Servo Assembly (PSA)

1 - Apollo Guidance Computer Group

1 - G&N Interconnect Harness Assembly

1 - Signal Conditioner Assembly

1 - Display and Control Group (D & C)

1 - Coupling Data Unit

1.2 The G&N System herein shall be identified as a Block II system. The computer contains the program flight ropes in the core rope memory. The test requirements herein are based on Colossus Rev. 237 flight ropes.

2.0 SCOPE

2.1 This specification outlines the checkout requirements for the G&N System installed in the Apollo Command Module Spacecrafts and tested in the VAB, MSOB, or on the PAD.

2.2 This document is to be used as technical support for all Block II G&N System test documentation for Command Module spacecraft testing. This document shall be amended by addendum to support applicable hardware, mission or program differences.

6.2.2.2.2 (continued)

d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row's 1, 2, 3
l. VERB-NOUN Flashing
m. COMP ACTY

On concurrently for 5 seconds.

n. Plus signs in Row's 1, 2, 3
o. VERB-NOUN Flashing
p. COMP ACTY

On concurrently for 5 seconds.

q. DSKY blanks - - COMP ACTY remains on for approximately 5 seconds and then blanks.

6.2.2.3 Caution and Status Displays

6.2.2.3.1 Enter VERB 35, ENTR, into LEB CMC DSKY.

6.2.2.3.2 The following MDC and LEB CMC DSKY displays shall illuminate for approximately 5 seconds.

a. UPLINK ACTY

b. NO ATT

c. STBY

d. KEY REL Flashing

e. TEMP

f. GIMBAL LOCK

g. PROG

h. RESTART

i. TRACKER

j. OPR ERR Flashing

k. COMP ACTY (only momentarily on).

l. Program 88

m. VERB 88 NOUN 88 flashing

n. +88888 in R1, R2 and R3

o. PGNCS, CMC, ISS Warning lamps (CMC shall remain illuminated for 15±5 seconds).

After indications a. through m. go out, +88888 shall remain in R1, R2, R3.

6.2.2.6.1 Enter the following into K-148:

a. VERB 24 NOUN 02, ENTER
b. 02100 ENTER
c. 33777, ENTER
d. 05112, ENTER
e. VERB 25 NOUN 26, ENTER
f. 04000, ENTER
g. 01500 ENTER
h. 00004 ENTER
i. VERB 30, ENTER

The RESTART lamps on the MDC & LEB DSKY's shall illuminate. The PGNS caution lamps on the MDC & LEB annunciator panels shall illuminate.

6.2.2.6.2 Press the ERROR RESET pushbutton on K-148. The RESTART & PGNS caution lamps shall extinguish.

6.2.2.6.3 Enter VERB 36, into K-148. Press the ENTER pushbutton.

6.2.2.7 Rupt Lock Test

6.2.2.7.1 Enter the following sequence intc K-148:

a. VERB 24 NOUN 01, ENTER
b. 02100, ENTER
c. 30001, ENTER
d. 01500, ENTER
e. VERB 25 NOUN 26, ENTER
f. 00001, ENTER
g. 01500, ENTER
h. 00004, ENTER
i. VERB 31, ENTER

The RESTART and PROG lamps on the MDC and LEB DSKY's shall illuminate. The PGNS caution lamps on the MDC & LEB annunciator panels shall illuminate.

6.2.2.7.2 Press the ERROR RESET pushbutton on K-148. The RESTART & PGNS caution lamps shall extinguish.

6.2.2.7.3 Enter VERB 36 into K-148. Press the ENTER pushbutton.

6.2.2.8 TC Trap Test

6.2.2.8.1 Enter the following sequence into K-148:

a. VERB 21 NOUN 01 ENTR
b. 01470 ENTR
c. 31474 ENTR
d. NOUN 15 ENTR
e. 54067 ENTR ENTR
f. 31475 ENTR ENTR
g. 54001 ENTR ENTR
h. 14712 ENTR ENTR
i. 00067 ENTR
j. VERB 25 NOUN 26 ENTR
k. 35000 ENTR
l. 01470 ENTR
m. 00003 ENTR
n. VERB 30 ENTR

The RESTART and PROG lamps on the MDC and LEB DSKY's shall illuminate. The PGNS caution lamps on the MDC and LEB annunciator panels shall illuminate.

6.2.2.8.2 Press the ERROR RESET pushbutton on the K-148. All alarms shall clear.

6.2.2.8.3 Enter VERB 36 ENTR into K-148.

6.2.2.8.4 Enter the following sequence into K-148:

a. VERB 21 NOUN 01 ENTR
b. 01470 ENTR
c. 30067 ENTR
d. NOUN 15 ENTR
e. 31474 ENTR ENTR
f. 22000 ENTR ENTR
g. 22005 ENTR ENTR
h. 01470 ENTR
i. VERB 25 NOUN 26 ENTR
j. 36000 ENTR
k. 01470 ENTR
l. 00003 ENTR
m. VERB 30 ENTR

The RESTART and PROG lamps on the MDC and LEB DSKY's shall illuminate. The PGNS cautior lamps on the MDC and LEB annunciator panels shall illuminate.

6.2.2.8.5 Press the ERROR RESET pushbutton on the K-148. All alarms shall clear.

6.2.2.8.6 Enter VERB 36 into K-148. Press ENTR pushbutton.

6.2.2.9 Nightwatchman Test

6.2.2.9.1 Enter the following sequence into K-148.

a. VERB 24 NOUN 01 ENTR
b. 02100, ENTR
c. 30001, ENTER
d. 01500, ENTER
e. VERB 25, NOUN 26, ENTR
f. 04000, ENTR
g. 01500, ENTR
h. 00004, ENTR
i. VERB 30, ENTR

The RESTART and PROG lamps on the MDC & LEB DSKY's shall illuminate. The PGNS caution lamps on the MDC & LEB annunciator panels shall illuminate.

6.2.2.9.2 Press the ERROR RESET pushbutton on K-148. The RESTART & PGNS caution lamps shall extinguish.

6.2.2.9.3 Enter VERB 36 into K-148. Press the ENTER pushbutton.

6.2.2.10 CMC Clock Frequency Test

6.2.2.10.1 Insure that CMC operate power has been applied for a minimum of 10 minutes before performing this test.

6.2.2.10.2 Verify that the counter is connected to the 3.2 kc signal on the hardline.

6.2.2.10.3 Insure that the counter has been warming up for a minimum of 30 minutes.

6.2.2.10.4 On the counter.

Set the FUNCTION switch to: MAN START
Set the TIME BASE switch to: 1 μsec TIME UNIT/COUNT
Set the SENSITIVITY control to: CHECK

6.2.2.10.5 Verify proper counter operation.

6.2.2.10.6 Set the FUNCTION switch to REMOTE OR TIME INTERVAL.

6.2.2.10.7 Plug in the Preset unit and set:

MODE switch to PRESET
N switches to 96000.

6.2.2.10.8 Turn SAMPLE RATE control fully clockwise (HOLD). Wait 35 seconds for counter display to fill.

6.2.2.10.9 Start counting by depressing RESET switch on counter.

6.2.2.10.10 After approximately 30 seconds, read and record counter display.

6.2.2.10.11 Repeat steps 6.2.2.10.9 and 6.2.2.10.10 nine times.

6.2.2.10.12 The average of the 10 previous readings shall be 30.000000±0.000060 seconds.

6.2.2.10.13 Insure that the system is not in IMU Operate.

6.2.2.10.14 Perform the following DSKY operations:

VERB 37	ENTR
06	ENTR/ENTR

Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the STBY lamp is lit.

6.2.2.10.15 Repeat steps 6.2.2.10.9 through 6.2.2.10.12.

6.2.2.10.16 Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the STBY lamp is not lit. If the STBY lamp does not extinguish when the PRO pushbutton is pressed, repeatedly press the PRO pushbutton until the STBY lamp does extinguish. Record the number of times it was necessary to press the PRO pushbutton. Not more than three depressions of the PRO pushbutton shall be required to turn the STBY lamp off.

6.2.3.1.6 (continued)

c. On the CRT, verify the absence of the +120 VDC PIPA supply (CG 1040) for a period of 90±10 seconds following power application in 6.2.3.1.5. Verify PIPA fail discrete is present during this period. After approximately 100 seconds, the voltage shall read +120±6 Vdc.

d. Stop the analog recorders.

6.2.3.1.7 Insure that the following alarm lamps are not lighted on G&N LEB Display Panel.

a. CMC Warning
b. ISS Warning
c. PGNS Caution

6.2.3.1.8 Verify that the PROG alarm lamp on the DSKY's does not light.

6.2.3.1.9 The OG, IG, and MG CDU angles shall be approximately zero. Verify on CRT.

6.2.3.1.10 Enter the following into K-148:

a. VERB 41 NOUN 20, ENTER
b. +00000, ENTER
c. +00000, ENTER
d. +00000, ENTER

6.2.3.1.11 Verify that the following secondary power supply voltages are not flashing on the CRT display.

SECONDARY POWER SUPPLY VOLTAGES

Meas. No.	Signal
1. CG 1040	+120 VDC PIPA SUPPLY
2. CG 1051	+20 VDC PIPA SUPPLY
3. CG 1052	-20 VDC PIPA SUPPLY
4. CG 1070	+4 VDC CDU SUPPLY
5. CG 1100	-28 VDC ELECTRONICS
6. CG 1020	+14 VDC CMC SUPPLY
7. CG 1030	+4 VDC CMC SUPPLY
8. CG 1201	IMU 28V 800 CPS 1 pct 0 ph
9. CG 1202	IMU 28V 800 CPS 5 pct ph A (-90°)
10. CG 1203	IMU 28V 800 CPS 5 pct ph B (0°)
11. CG 1331	3.2 KC 28V SUPPLY
12. CG 1110	2.5 VDC TM BIAS

6.2.3.1.12 The IMU Platform should not be moved during the Temperature Control Tests. 15 minutes after the application of IMU OPERATE power record PIPA TEMP (CG 2300) displayed on the CRT.

6.2.3.3.3 On MDC panel 1, press and hold the IMU CAGE switch in the CAGE position. On the Analog Recorder, verify that the 1X Sine signals (CG 2112, CG 2142, and CG 2172) null out at 0.5V rms or less.

6.2.3.3.4 Release the IMU CAGE switch. Disregard any momentary transients on the 1X Resolver Sine signals when the switch is released. Sustained oscillations shall be cause for immediate removal of IMU OPERATE power.

6.2.3.3.5 On the CRT verify that CDUX, CDUY and CDUZ are all between +35850 and +00150.

6.2.3.3.6 Stop the Analog Recorders.

6.2.5.2.11 When tape reader stops, verify:

R1 = 00101

6.2.5.2.12 Start tape reader

6.2.5.2.13 Monitor DSKY until R2 (SCOUNT+1) increments twice. If an error is detected, the PROG alarm lamp on the DSKY shall light.

6.2.5.2.14 On K-148, enter the following to turn off Self-Check:

VERB 21 NOUN 27 ENTR
00000 ENTR
VERB 34 ENTR

6.2.5.2.15 NOTE: Allow 2 hours to elapse before proceeding, with the following exceptions:

a. If the G&N System has been in the power off state for less than 5 days with the gimbals in the following positions,

X = 000.00±005.00 deg
Y = 000.00±005.00 deg
Z = 090.00±005.00 deg

or has been in the power off state for less than 12 days with the gimbals in the following positions,

X = 000.00±001.00 deg
Y = 000.00±001.00 deg
Z = 090.00±001.00 deg

and the system has not been moved, allow 15 minutes to elapse before proceeding.

b. If the G&N System has been turned off with the gimbals in the unparked position for less than 2 hours allow a warmup time equal to the time off but not less than 15 minutes to elapse before proceeding.

CAUTION: If the requirements of 6.2.5.2.16 are not met, remove IMU Operate Power immediately by setting the G/N POWER-IMU switch on the LEB Lighting Control Panel to OFF.

After the required warmup time has elapsed set the G&N IMU MN A and MN B circuit breaker on the Right Hand circuit breaker panel to ON (breaker pushed in), and the G/N POWER-IMU switch on the LEB Lighting Control panel to the IMU position (toggle up).

6.2.5.2.16 Immediately begin monitoring the following measurements.

a. On the CRT verify that IMU Operate Power is +28.8±3 VDC (CG 1500).

b. On the meter modules verify that oscillations are not sustained and that a null is achieved within 10 seconds of power application on the following measurements:

CG 2112	IG 1X Resolver Output Sin
CG 2142	MG 1X Resolver Output Sin
CG 2172	OG 1X Resolver Output Sin

c. On the CRT verify the absence of the +120 VDC PIPA Supply (CG 1040) for a period of 90±10 seconds following power application. After approximately 100 seconds, the voltage shall read +120±6 VDC.

6.2.5.2.17 Verify that the PROG alarm lamp on the DSKY's does not light.

6.2.5.2.18 Enter VERB 40, NOUN 20, ENTER into K148. Wait 15 seconds.

6.2.5.2.19 On K-148 enter the following.

VERB 41 NOUN 20	ENTER
+00000	ENTER
+00000	ENTER
+00000	ENTER

6.2.5.2.20 Set the G&N OPTICS MN A and MN B circuit breakers on the Right Hand Circuit breaker panel to the ON position (breaker pushed in).

6.2.5.2.21 Verify that the CRT indications of the signals in table below are not flashing.

Secondary Power Supply Voltages

Measurement Number	Signal
1. CG 1040	+120 VDC PIPA SUPPLY
2. CG 1051	+20 VDC PIPA SUPPLY
3. CG 1052	-20 VDC PIPA SUPPLY
4. CG 1070	+4 VDC CDU SUPPLY
5. CG 1100	-28 VDC ELECTRONICS
6. CG 1020	+14 VDC CMC SUPPLY
7. CG 1030	+4 VDC CMC SUPPLY
8. CG 1201	IMU 28V 800 CPS 1 pct 0 pha
9. CG 1202	IMU 28V 800 CPS 5 pct ph A
10. CG 1203	IMU 28V 800 CPS 5 pct ph B
11. CG 1331	3.2 KC 28V SUPPLY
12. CG 1110	2.5 VDC TM BIAS

6.2.5.2.22 Monitor the PIPA Display Scope to insure that each PIPA is moding properly.

6.2.5.2.23 Perform 6.2.6 G&N Operational Test.

6.2.8 G&N Panel Brightness and Lamp Test

6.2.8.1 Proceed with this test if 6.2.5.2 or 6.2.3 has been performed and system operation has not been interrupted. If system operation has been interrupted, perform 6.2.5.2 before proceeding with this test.

6.2.8.2 Rotate the RETICLE BRIGHTNESS thumbwheel on the Control Indicator Panel and verify the capability to control the illumination of the following lamps:

a. SCT reticles
b. SXT reticles
c. Telescope Panel Angle Counters

6.2.8.3 Turn on LIGHTS-INTEGRAL control on Left Hand Circuit Breaker panel and LEB Lighting Control Panel.

6.2.8.4 Adjust the brightness controls on the LEB Lighting Control Panel and Left Hand Circuit Breaker Panel from minimum brightness to maximum brightness. Verify the operation of the G&N Indicator Control Panel lamps and LEB DSKY key lamps. Adjust MDC INTEGRAL lighting control from minimum brightness to maximum brightness and verify illuminations of MDC key lamps.

6.2.8.4.1 Re-adjust brightness controls for minimum acceptable lighting. Turn off LIGHTS-INTEGRAL control on Left Hand Circuit Breaker panel and LEB Lighting Control Panel and MDC INTEGRAL lighting.

6.2.8.5 Push and hold the CONDITION LAMPS switch on the G&N Indicator Control Panel to TEST. Verify the illumination of the following lamps:

a. STAR ACQ
b. MASTER ALARM lamp

6.2.8.6 Set the CONDITION LAMPS switch to ON. Lamps a and b in 6.2.8.5 shall extinguish.

6.2.9.9.2 When tape reader stops wait approximately 10 seconds. Verify CRT DSKY Row 1 indicates 01101. Verify GIMBAL LOCK lamp is lighted.

6.2.9.10 Command Accuracy 225°.

6.2.9.10.1 Start tape reader.

6.2.9.10.2 When tape reader stops verify CRT DSKY Row 1 indicates 01201. GIMBAL LOCK lamp will be lighted. Wait 15 seconds.

6.2.9.10.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 225±003 degrees.

6.2.9.10.4 Read and record CRT CDU angle indications. Indications shall be +225.00±001.50.

6.2.9.11 ISS CDU Command Rate Test

6.2.9.11.1 Start tape reader.

6.2.9.11.2 When tape reader stops verify CRT DSKY display Row 1 indicates 01301. Wait 10 seconds. Verify IMU Gimbals are at approximately 0° and GIMBAL LOCK lamp is OFF.

6.2.9.11.3 Middle Gimbal Rate Test

6.2.9.11.3.1 Start tape reader.

6.2.9.11.3.2 When tape reader stops immediately verify display of 01401 in Row 1 of CRT DSKY display. In approximately 12 seconds VERB 23 NOUN 26 shall flash. The GIMBAL LOCK lamp shall be lit. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.2.9.11.4 Inner Gimbal Rate Test

6.2.9.11.4.1 Start tape reader.

6.2.9.11.4.2 Approximately 12 seconds after the tape reader stops VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.2.9.11.5 Outer Gimbal Rate Test.

6.2.9.11.5.1 Start tape reader.

6.2.9.11.5.2 Approximately 12 seconds after the tape reader stops VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.2.9.11.6 Start tape reader.

6.2.9.11.6.1 Wait 15 seconds. Verify IMU Gimbals are at approximately 0° and GIMBAL LOCK LAMP is OFF.

6.2.9.12 Command Accuracy 315°.

6.2.9.12.1 Start tape reader.

6.2.9.12.2 When tape reader stops verify CRT DSKY Row 1 indicates 01501.

6.2.9.12.3 Read and record CRT IMU Gimbal Angles. Indication shall be 315±003 degrees.

6.2.9.12.4 Read and record CRT CDU angle indications. Indications shall be +315.00±001.50.

6.2.9.13 CDU Repeating Accuracy 315°.

6.2.9.13.1 Start tape reader.

6.2.9.13.2 Approximately 5 seconds after the tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.14 Minus Gimbal Lock Test.

6.2.9.14.1 Start tape reader.

6.2.9.14.2 When tape reader stops verify CRT DSKY Row 1 indicates 01701. Verify GIMBAL LOCK lamp is lighted after approximately 5 seconds.

6.2.9.15 CDU Repeating Accuracy 225°.

6.2.9.15.1 Start tape reader.

6.2.9.15.2 When tape reader stops verify CRT DSKY Row 1 indicates 02001. Wait 10 seconds before continuing. Verify GIMBAL LOCK lamp is OFF.

6.2.9.15.3 Start tape reader.

6.2.9.15.4 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 will flash. Read and record CRT DSKY Row 1, 2 and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.16 OG CDU Fine Fail Test.

6.2.9.16.1 Start tape reader.

6.2.9.16.2 When tape reader stops verify CRT DSKY Row 1 indicates 02101.

6.2.9.16.3 Start tape reader.

6.2.9.16.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.16.5 Start tape reader.

6.2.9.16.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is OFF. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.17 IG CDU Fine Fail Test

6.2.9.17.1 Start tape reader.

6.2.9.17.2 When tape reader stops verify CRT DSKY Row 1 indicates 02201.

6.2.9.17.3 Start tape reader.

6.2.9.17.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.17.5 Start tape reader.

6.2.9.17.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.18 MG CDU Fine Fail Test.

6.2.9.18.1 Start tape reader.

6.2.9.18.2 When tape reader stops verify CRT DSKY Row 1 indicates 02301.

6.2.9.18.3 Start tape reader.

6.2.9.18.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.18.5 Start tape reader.

6.2.9.18.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.21.5 Start tape reader.

6.2.9.21.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.22 Optics CDU Command Rate Test.

6.2.9.22.1 Set the G/N POWER - OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify OPTX BUS, 28V 800∿ 1% and 5% Power Supplies.

6.2.9.22.2 Set the OPTICS COUPLING switch on the G&N Panel to DIRECT. Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +5 degrees of zero as indicated by the TPAC (Telescope Trunnion Slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 20 seconds. Set the OPTICS ZERO switch to OFF. Set the OPTICS MODE switch to CMC.

6.2.9.22.3 Shaft Slew Rate Test.

6.2.9.22.3.1 Start tape reader.

6.2.9.22.3.2 In approximately 25 seconds VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 00018.88000 and 00011.32000.

6.2.9.22.4 Trunnion Slew Rate Test

6.2.9.22.4.1 Start tape reader.

6.2.9.22.4.2 In approximately 15 seconds VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 00004.71000 and 00002.83000.

6.2.9.23 Test Termination

6.2.9.23.1 Start tape reader.

6.2.9.23.2 On the GNIC Panel, set the OPTICS MODE switch to MAN. Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within 5 degrees of zero, as indicated by the TPAC (Telescope Trunnion Slaved to SXT).

6.2.9.23.3 Set the OPTICS ZERO switch to ZERO. Wait 20 seconds. Set the OPTICS MODE switch to CMC.

6.2.9.23.4 Switch the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OFF.

DATA SHEET

PARAMETER	UNITS	D_1	MAX	D_2	MAX	D_3	MAX
NBDY	meru		6.0		9.0		11.0
NBDZ	meru		6.0		9.0		11.0
NBDX	meru		6.0		9.0		11.0
ADSRAY	meru/g		14.0		21.0		25.0
ADSRAZ	meru/g		14.0		21.0		25.0
ADSRAX	meru/g		14.0		21.0		25.0
ADIAX	meru/g		17.0		33.0		40.0
ADIAZ	meru/g		17.0		33.0		40.0
ADIAY	meru/g		17.0		33.0		40.0
X PIPA S.F. error	PPM		400		500		600
Y PIPA S.F. error	PPM		400		500		600
Z PIPA S.F. error	PPM		400		500		600
X PIPA Bias	cm/sec^2		0.50		0.70		0.90
Y PIPA Bias	cm/sec^2		0.50		0.70		0.90
Z PIPA Bias	cm/sec^2		0.50		0.70		0.90

6.2.17 SXT-NB-IMU Fine Align Test (see Table III, Section 5)

6.2.18 Gyro Compassing Test

6.2.18.1 Set the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify that +28 vdc OPTICS OPERATE BUS (CG 1530) is +28.0±3.0 vdc. Verify that the OPTX 28V 800 cps 1% 0° (CG 1211) and OPTX 28V 800 cps 5% -90° (CG 1212) are not flashing in the CRT.

6.2.18.2 Enter the following into the CMC:

VERB 37 ENTER 01 ENTER

6.2.18.3 When PROG display changes to 02, record time as T_0.

6.2.18.4 Gyro Compassing Accuracy

6.2.18.4.1 Wait 120 minutes from T_0. Record Inner, Middle and Outer Gimbal CDU readings every 5 minutes for the next 2 hours.

6.2.18.4.2 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO.

6.2.18.4.3 Enter VERB 65, ENTER into DSKY.
Observe the PROG display on the DSKY change to 03.

6.2.18.4.4 When VERB 06 NOUN 41 flashes on the DSKY, insure R1 and R2 display Target 1 azimuth and elevation.

a. R1 = +XXX.XX (Target 1 azimuth)
b. R2 = +XX.XXX (Target 1 elevation)
c. R3 = 00001

6.2.18.4.5 Verify the data appearing in R1 and R2 and if correct, proceed. If not correct, perform the following sequence:

a. VERB 24, ENTER
b. +XXX.XX, ENTER (Target 1 azimuth)
c. ±XX.XXX, ENTER (Target 1 elevation)

6.2.18.4.6 After the correct readings for R1 and R2 are verified, enter VERB 33, ENTER into the DSKY.

6.2.18.4.7 When VERB 06 NOUN 41 flashes on the DSKY, insure that R1 and R2 display Target 2 azimuth and elevation.

a. R1 = XXX.XX (Target 2 azimuth)
b. R2 = XX.XXX (Target 2 elevation)
c. R3 = 00002.

6.2.18.4.8 Verify the data appearing in R1 and R2 and if correct, perform the following sequence:

a. VERB 24, ENTER
b. +XXX.XX, ENTER (Target 2 azimuth)
c. ±XX.XXX, ENTER (Target 2 elevation)

6.2.18.4.9 After the correct readings for R1 and R2 are verified, enter VERB 33, ENTER into the DSKY.

6.2.18.4.10 Set the OPTICS ZERO switch to OFF. Enter VERB 33 ENTER into the DSKY.

6.2.18.4.11 When the DSKY displays V51 flashing and R1 = 00001 set the OPTICS MODE switch on the G&N Indicator Control Panel to CMC. The CMC will align the SXT star LOS to the Target 1 position. When the alignment is complete as observed by no further movement of the Telescope Panel Angle Counters (TPAC) set the OPTICS MODE switch to MANUAL.

6.2.18.4.12 Using the OPTICS Hand Controller and a convenient CONTROLLER SPEED, align the SXT StLOS with Target 1 and press the MARK pushbutton. In approximately 30 seconds VERB 50 NOUN 25 shall flash with R1 = 00016. If satisfied that the MARK was good press the PRO pushbutton. If not satisfied with MARK, press the MARK REJECT pushbutton and repeat this step.

6.2.18.4.13 When the DSKY displays VERB 51 flashing and R1 = 00002 set the OPTICS MODE switch to CMC. The CMC will align the SXT to the Target 2 position. When alignment is complete as observed by no further movement of the TPAC, set the OPTICS MODE switch to MANUAL.

6.2.18.4.14 Using the OPTICS Hand Controller and a convenient CONTROLLER SPEED, align the SXT StLOS with Target 2 and press the MARK pushbutton. In approximately 30 seconds VERB 50 NOUN 25 shall flash and R1 = 00016. If satisfied that the MARK was good press the PRO pushbutton. If not satisfied with the MARK press the MARK REJECT pushbutton and repeat this step.

6.2.18.4.15 On the DSKY, observe the following data displayed:

VERB 06 NOUN 93
R1 = ±XX.XXX (X gyro elevation error, deg)
R2 = ±XX.XXX (Y gyro elevation error, deg)
R3 = ±XX.XXX (Z gyro azimuth error, deg)

Record R1, R2 and R3. The X and Y gyro elevation error shall be 0.00±0.55 degrees and the Z gyro azimuth error shall be 0.00±0.3 degrees. Enter VERB 34 ENTR into the DSKY. Observe PROG display on DSKY change to 02.

6.2.18.4.16 Immediately repeat steps 6.2.18.4.2 through 6.2.18.4.15 twice.

6.2.18.4.17 Repeat steps 6.2.18.4.1 through 6.2.18.4.15 at 150, 180 and 210 minutes from T_0.

6.2.18.4.18 Enter VERB 36 ENTR into the DSKY.

6.2.18.4.19 Enter the following into the DSKY:

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

Set the G&N POWER OPTICS switch on the LEB Lighting Control Panel to OFF.

6.2.18.5 Gyro Compassing Stability

6.2.18.5.1 Calculate the average of the first three X and Y gyro elevation errors and the first three Z gyro azimuth errors.

6.2.18.5.2 The last three X and Y gyro elevation errors shall not deviate from the baseline X and Y gyro elevation errors determined above by more than ±0.15 degrees.

6.2.18.5.3 The last three Z gyro azimuth errors shall not deviate from the baseline Z gyro azimuth error determined above by more than ±0.06 degrees.

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POST INSTALLATION CHECKOUT PROCESS SPECIFICATION FOR THE APOLLO GUIDANCE & NAVIGATION SYSTEM BLOCK II-KSC WITH COLOSSUS FLIGHT ROPES

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				AC	NASA
9/5/68	A	36792	2, 10, 12, 22, 32, 40, 41, 43, 44, 53,	EA	WLS
			78, 93, 108, 109, 111, 122, 124-		
			126, 129		
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2/3/69	C	37296	2, 8, 21, 22, 33, 44, 53, 78, 93, 124,	EA	WLS
			128		

This specification consists of page 1 to 130 **inclusive.**

APPROVALS	NOT REQUIRED CCA497-0274 **NASA/MSC**	**MIT/IL**	CCB 7/25/6	**AC**

1.0 INTRODUCTION

1.1 The individual Spacecraft (SC) installed Guidance and Navigation (G&N) System to be checked out per this process specification shall consist of one of each of the following major assemblies: The test requirements herein are based on COLOSSUS Rev. 237 and COLOSSUS Rev. 249 flight ropes.

1 - Optical Unit Assembly

1 - Navigation Base Assembly, Block II

1 - Inertial Measurement Unit (IMU) & PIPA Elect. Assy

1 - Power and Servo Assembly (PSA)

1 - Apollo Guidance Computer Group

1 - G&N Interconnect Harness Assembly

1 - Signal Conditioner Assembly

1 - Display and Control Group (D & C)

1 - Coupling Data Unit

1.2 The G&N System herein shall be identified as a Block II system. The computer contains the program flight ropes in the core rope memory. The test requirements herein are based on Colossus Rev. 237 and Rev. 249 ropes.

2.0 SCOPE

2.1 This specification outlines the checkout requirements for the G&N System installed in the Apollo Command Module Spacecrafts and tested in the VAB, MSOB, or on the PAD.

2.2 This document is to be used as technical support for all Block II G&N System test documentation for Command Module spacecraft testing. This document shall be amended by addendum to support applicable hardware, mission or program differences.

6.2.1.3.4 The +28 VDC CMC OPERATE voltage (CG 1520) shall be +28.8±3 VDC. Verify CRT indication. On DSKY verify TEMP light is ON. On the G&N Indicator Control Panel verify PGNS light is ON.

6.2.1.3.5 The voltage output of the +4 VDC CMC supply shall be +4.00±0.20 VDC. (CG 1030). The value on the CRT shall be recorded.

6.2.1.3.6 The voltage output of the +14 VDC CMC supply shall be +14.0±0.4 VDC, (CG 1020). The value on the CRT shall be recorded.

6.2.1.3.7 Using DSKY, enter VERB 36, ENTR, then press RESET. Verify that R1, R2, R3, VERB, NOUN, and PROG are blank.

6.2.1.3.8 IMU HTR Heater Power On

6.2.1.3.8.1 Enter the IMU Standby Mode of operation by engaging the IMU HTR MN A and MN B breakers on the Right Hand Circuit Breaker Panel (breakers pushed in).

NOTE: RESTART Lamp may illuminate, if it does, disregard and press RSET on the DSKY.

6.2.1.3.8.2 Verify that the IMU +28 VDC STANDBY discrete lamp on Event Module is illuminated (CG 1513). On DSKY verify TEMP light is extinguished. On the G&N Indicator Control Panel verify PGNS light is extinguished.

6.2.1.3.8.3 Record the value of the following signals displayed on the CRT.

	Signal	Requirement
a.	CG 1331 28V 3200 CPS POWER SUPPLY FEEDBACK	28.6±0.6 VRMS
b.	CG 1510 +28 VDC STANDBY POWER	28.8±3 VDC

6.2.1.3.8.4 The PIPA TEMP on the CRT shall be monitored at 15 min., 1 hr. and 2 hrs. from execution of 6.2.1.3.8.1 to insure that the PIPA Temperature Control Loop circuitry is operating to maintain a temperature of 130.5±1.5°F (CG2300).

6.2.1.3.8.5 At the end of the 2-hour period, record the PIPA temperature (CG2300) on the CRT. On the event recorder verify that the IMU HEATER current discrete (CG2302) is ON and that the IMU BLOWER current discrete (CG2303) is OFF over the last two hour period (occasionally discretes may cycle).

6.2.1.3.8.6 With the eyepiece in the Eyepiece Storage Unit, check the eyepiece surface temperature at the quick disconnect flange using an L&N #8693 Temperature Potentiometer, or a similar type thermocouple probe meter. Record both the ESU ambient and eyepiece surface temperatures. Verify that the eyepiece surface temperature is between 2 and 30 degrees F. above the ambient temperature.

6.2.2 **CMC Operational Test**

NOTE: Verify that IMU STANDBY power (including CMC operate power) is applied, IMU OPERATE Power is not applied. (G&N IMU HTR MN A and MN B breakers engaged, Computer MN A and MN B breakers engaged, IMU MN A and MN B breakers disengaged, G/N Power-IMU switch on LEB Lighting Control Panel in OFF Position).

6.2.2.1 CMC Self-Check.

6.2.2.1.1 On K-148, enter the following:

VERB 36 ENTR Wait 10 seconds.

6.2.2.1.2 Verify K-START tape F09CXXX-K10538-XX CM Self-Check is on the K-START tape reader, where XXX is the Spacecraft effectivity and XX is the tape revision number.

6.2.2.1.3 Start tape reader.

6.2.2.1.4 When tape reader stops, verify the following on the CRT DSKY display:

R1 = +09237 OR +09249 (Dependent on flight rope revision being used.)
R2 = +10538 (tape number)
R3 = -000XX (tape revision number)

6.2.2.1.5 Load E-Memory Program.

6.2.2.1.5.1 Start tape reader.

6.2.2.1.5.2 When tape reader stops, verify R1 displays +00101.

6.2.2.1.6 Initiate Self-Check

6.2.2.1.6.1 Start tape reader.

6.2.2.1.6.2 When R3 = 00002, start tape reader.

6.2.2.1.6.3 When tape reader stops, wait 30 seconds.

6.2.2.2 DSKY Check.

6.2.2.2.1 Start tape reader.

6.2.2.2.2 All the electroluminescent elements (PROG, VERB, NOUN, and Row 1, Row 2, Row 3) shall display the decimal number nine (9). Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's

6.2.3.1.13 1 hour after the application of IMU OPERATE power monitor and record PIPA TEMP (CG 2300) every 5 minutes for 30 minutes. Verify that each reading does not deviate from the average of each signal by more than 0.1°F.

6.2.3.1.14 When 2 hours have elapsed since the application of IMU OPERATE power record PIPA TEMP. PIPA TEMP shall be 130.5±1.5°F. PIPA TEMP shall be within 0.5°F of that recorded in 6.2.3.1.12 and 6.2.1.3.8.4.

6.2.3.2 Optics Power ON

6.2.3.2.1 Optics power shall be applied by actuating the G&N OPTICS MN A and OPTICS MN B breakers on the Right Hand Circuit Breaker Panel (breakers pushed in), and placing G/N Power - OPTICS switch on the LEB Lighting Control Panel to ON.

6.2.3.2.2 OPTICS +28 VDC discrete shall be issued (CG 1533). Verify by observing that the OPTICS lamp on Event Module is illuminated. Verify that the +28 VDC OPTX OPERATE BUS (CG 1530) is +28.8±3 VDC. Record the indication on the CRT.

6.2.3.2.3 Verify the following secondary power supply voltages on the CRT are not flashing:

CG 1211	OPTX 28V 800 CPS 1 pct 0 ph
CG 1212	OPTX 800 CPS 5 pct-90 ph

6.2.3.2.3.1 Set/verify OPTICS MODE on the G&N Indicator Control Panel to MAN.

6.2.3.2.3.2 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Indicator Panel to ZERO.

6.2.3.3 IMU Cage Test

6.2.3.3.1 Enter the following into the DSKY:

a. VERB 40 NOUN 20, ENTER (wait 3 seconds)
b. VERB 41 NOUN 20, ENTER
c. +00200, ENTER
d. +00200, ENTER
e. +00200, ENTER

Observe that the NO ATT lamps on the DSKY's light and that CDUX, CDUY, CDUZ on the CRT indicate approximately +00200.

6.2.3.3.2 Set up the Analog Recorder to monitor the following signals:

a. IG 1X Resolver Output Sine (CG 2112)
b. MG 1X Resolver Output Sine (CG 2142)
c. OG 1X Resolver Output Sine (CG 2172)

Start the Analog Recorders.

6.2.6 G&N Operational Test

6.2.6.1 Verify K-START tape F09CXXX-K10531-XX CM G/N OPCHK is on K-START tape reader, where XXX is the Spacecraft effectivity and XX is the tape revision number.

6.2.6.1.1 Start tape reader.

6.2.6.1.2 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = +09237 OR +09249 (Dependent on flight rope revision being used.
b. R2 = +10531 (tape number)
c. R3 = -000XX (tape revision number)

6.2.6.2 E-Memory Program Load and Sum Check.

6.2.6.2.1 Start tape reader.

6.2.6.2.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00101.

6.2.6.3 Local g Measurement.

6.2.6.3.1 Start tape reader.

6.2.6.3.2 In approximately 10 minutes, VERB 06 NOUN 98 shall flash.

6.2.6.3.3 From the CRT DSKY display read and record Row 1 and Row 2 (local gravity whole and fractional, respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.2.6.4 Horizontal Earth Rate Measurement.

6.2.6.4.1 Press PRO pushbutton on DSKY.

6.2.6.4.2 In approximately 2 seconds VERB 06 NOUN 98 shall flash. From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.2.6.5 Enter the following on K-148:

VERB 34 ENTR
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.2.9 **Semi-Automatic Mode Test**

6.2.9.1 Verify K-START tape F09CXXX-K10530-XX CM Semi-Automatic Mode Test is on K-START tape reader, where XXX is the Spacecraft effectivity and XX is the tape revision number.

6.2.9.1.1 Start tape reader.

6.2.9.1.2 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = +09237 OR +09249 (Dependent on flight rope revision being used.)
b. R2 = +10530 (tape number)
c. R3 = -000XX (tape revision number)

6.2.9.2 E-Memory Program Load

6.2.9.2.1 Start tape reader.

6.2.9.2.2 When tape reader stops verify the following on CRT DSKY:

R1 = 00101

6.2.9.3 Command Accuracy 0°.

6.2.9.3.1 Start tape reader

6.2.9.3.2 When tape stops verify that CRT DSKY R1 indicates 00201. Wait 15 seconds.

6.2.9.3.3 Read and record CRT IMU Gimbal angles. The indications shall be 000±003 degrees.

6.2.9.3.4 Read and record CRT CDU angle indications. The indications shall be +000.00±001.50.

6.2.9.4 Command Accuracy 45°.

6.2.9.4.1 Start tape reader.

6.2.9.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00301. Wait 5 seconds.

6.2.9.4.3 Read and record CRT IMU Gimbal angles. The indications shall be 045±003 degrees.

6.2.9.4.4 Read and record CRT CDU angle indications. Indications shall be +045.00±001.50.

6.2.9.5 CDU Repeating Accuracy 45°.

6.2.15 IRIG Scale Factor Test

6.2.15.1 Verify K-START tape F09CXXX-K00083-XX IRIG Scale Factor Test is on the K-START tape reader, where XXX is the Spacecraft effectivity and XX is the tape revision number.

6.2.15.2 Start tape reader.

6.2.15.2.1 When tape reader stops verify the following on the CRT DSKY display:

a. R1 = +09237 OR +09249 (Dependent on flight rope revision being used.)
b. R2 = +00083 (tape number)
c. R3 = -000XX (tape revision number)

6.2.15.2.2 Start tape reader.

6.2.15.2.3 When tape reader stops, wait 20 seconds.

6.2.15.3 E-Memory Program Load.

6.2.15.3.1 Start tape reader.

6.2.15.3.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00000.

6.2.15.4 Test Position Data Load (+X Scale Factor)

6.2.15.4.1 Start tape reader.

6.2.15.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.2.15.4.3 Start tape reader

6.2.15.4.4 When tape reader stops, VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nave Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.4.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.4.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001).

6.2.16 IMU Performance Test. A reference data sheet is provided at the end of this section to aid in data reduction.

6.2.16.1 Insure that IMU Operate power and LGC Operate power has been supplied for a minimum of one hour and that the IMU is not in a Gimbal Lock condition.

6.2.16.2 On CRT, monitor and record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.2.16.3 Verify K-START tape F09CXXX-K00081-XX IMU Performance Test is on the K-START tape reader, where XXX is the Spacecraft effectivity and XX is the tape revision number.

6.2.16.4 Start tape reader.

6.2.16.4.1 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = +09237 OR +09249 (Dependent on flight rope being used.)
b. R2 = +00081 (tape number)
c. R3 = -000XX (tape revision number)

6.2.16.4.2 Start tape reader.

6.2.16.4.3 When tape reader stops, wait 10 seconds.

6.2.16.5 Start the tape reader. After 15 seconds, verify IMU is coarse aligned to zero degrees.

6.2.16.6 E-Memory Program Load.

6.2.16.6.1 Start the tape reader. When tape reader stops, verify the following DSKY display:

Row 1
Row 3

6.2.16.7 Test Position +00001.

6.2.16.7.1 E-Memory Program and Test Position Matrix Sum Check

6.2.16.7.1.1 Start tape reader.

6.2.16.7.1.2 When tape reader stops, verify DSKY Row 1 displays +00001.

6.2.19 CMC Voltage Margin Test

6.2.19.1 Verify that the G&N IMU HTR MNA & MNB circuit breakers are engaged, Computer MNA & MNB breakers are engaged, IMU MNA & MNB circuit breakers are not engaged, and the G&N Power - IMU switch on the LEB Lighting Control Panel is in the OFF position.

6.2.19.2 On the PSA Adapter Module set the INHIBIT VOLTAGE FAIL switch to ON.

CAUTION: During the performance of this test the +4 VDC CMC Power Supply shall not be operated at less than +2.5 VDC or greater than 5.2 VDC (CG 1030). The +14 VDC CMC Power Supply shall not be operated at less than +8.5 VDC or greater than +17.0 VDC (CG 1020). Rotate the LEB LTS NUMERICS SEL to approximately center position. Decrease to absolute minimum discernable lighting.

NOTE: The flashing indication of the CMC Power Supplies on CRT may be disregarded for this test.

6.2.19.3 Into R154 insert 0001. Verify and execute.

6.2.19.3.1 Into R153 insert 1100. Verify and execute.

6.2.19.4 Into C156 insert -040001244. Verify and execute. Verify on the CRT that GV0116 is between -3.0 and -5.0 VDC.

6.2.19.5 Into C156 insert -050001234. Verify and execute. Verify on the CRT that. GV0106 is between -4.0 and -6.0 VDC.

6.2.19.6 Into R154 insert 0111. Verify and execute.

6.2.19.7 Observe CG 1020, +14 VDC CMC Power Supply and CG 1030, +4 VDC CMC Power Supply, on the CRT. Repeat 6.2.19.3 through 6.2.19.6 adjusting each C-Start entry until CG 1020 is +12.1 (+0.1, -0.0) VDC and CG 1030 is +3.40 (+0.03 - 0.00) VDC.

6.2.19.8 On K-148, enter the following:

VERB 36 ENTR Wait 10 seconds.

6.2.19.9 Verify K-START tape F09CXXX-K10538-XX CM Self-Check Test is on the K-START tape reader, where XXX is the Spacecraft effectivity and XX is the tape revision number.

6.2.19.9.1 Start tape reader.

6.2.19.9.2 When tape reader stops, verify the following on the CRT DSKY display

R1 = +09237 OR +09249 (Dependent on flight rope revision being used.)
R2 = +10538 (tape number)
R3 = -000XX (tape revision number)

APPENDIX I

Signal	Link	Nomenclature	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
CG 1020	1	+14 VDC CMC SUPPLY	+14.0±0.4 VDC	0%
CG 1021	1	+14V CMC SUPPLY NOISE RMS	0.2 VRMS MAX	0%
CG 1030	1	+4 VDC CMC SUPPLY	+4.00±0.2 VDC	0%
CG 1031	1	+4V CMC SUPPLY NOISE RMS	0.2 VRMS MAX	0%
CG 1040	2	+120 VDC PIPA SUPPLY	+120±6.0 VDC	1%
CG 1042	1	+120 VDC PIPA SUP NOISE RMS	1.5 VRMS MAX	0%
CG 1051	1	+20 VDC PIPA SUPPLY	+20.0±1.2 VDC	0%
CG 1052	1	-20 VDC PIPA SUPPLY	-20±2 VDC	0%
CG 1053	1	+20 VDC PIPA SUP NOISE RMS	1.0 VRMS MAX	0%
CG 1070	1	+4 VDC CDU SUPPLY	+4.0±0.2 VDC	0%
CG 1071	1	+4 VDC CDU SUP NOISE RMS	0.1 VRMS MAX	0%
CG 1100	1	-28 VDC SUPPLY	-27.5±6.0 VDC	0%
CG 1110	2	2.5 VDC TM BIAS	+2.50±0.06 VDC	0%
CG 1201	2	IMU 28V .8KC 1% 0° RMS	28.00±0.56VRMS	1%
CG 1202	1	IMU 28V .8KC 5% - 90° RMS	28.0±1.4 VRMS	0.33%
CG 1203	1	IMU 28V .8KC 5% 0° RMS	28.0±2.1 VRMS	0.33%
CG 1207	1	PH DIFF IMU 5% 0°, -90°	-90±10°	2.3%
CG 1211	1	OPTX 28V .8KC 1% 0° RMS	28.00±0.56 VRMS	0.33%
CG 1212	1	OPTX 28V .8KC 5% - 90° RMS	28.00±1.48 VRMS	0.33%
CG 1220	1	PH DIFF OPTX 1% IMU 1%	0° ±10°	2.3%
CG 1331	2	3.2 KC 28V SUPPLY	28.6±0.56 VRMS	1%
CG 1336	1	PH DIFF 3.2 KC 28V/CMC SYNC	0° ±10°	2.3%
CG 1500	1	+28 VDC IMU OPERATE BUS	28.8±3 VDC	0%
CG 1501	1	+28V IMU OPERATE BUS NOISE RMS	1.0 VRMS MAX	0%
CG 1510	1	+28 VDC IMU STANDBY BUS	28.8±3 VDC	0%
CG 1511	1	+28V IMU STANDBY BUS NOISE RMS	1.0 VRMS MAX	0%
CG 1520	1	+28 VDC CMC OPERATE BUS	28.8±3 VDC	0%
CG 1521	1	+28V CMC OPERATE BUS NOISE RMS	2.0 VRMS MAX	0%
CG 1530	1	+28 VDC OPTX OPERATE BUS	28.8±3 VDC	0%
CG 1531	1	+28V OPTX OPERATE BUS NOISE RMS	2.0 VRMS MAX	0%
CG 2001	2	X PIPA SG O/P	5 VRMS max	3%
CG 2021	2	Y PIPA SG O/P	5 VRMS max	0.3%
CG 2041	2	Z PIPA SG O/P	5 VRMS max	3%
CG 2108	1	IG SERVO ERROR QUAD	0.0±1.2 VRMS	3.6%
CG 2112	2	IG 1X RESOLVER O/P SIN	18.38±1.84 VRMS @ 45°	2.5%
CG 2113	2	IG 1X RESOLVER O/P COS	18.38±1.84 VRMS @ 45°	2.5%
CG 2117	2	IG SERVO ERROR IN PHASE	0.0±60 mv RMS @ null	1.4%
CG 2120	1	IG TORQUE MOTOR CURRENT	0.125 amp max during Fine Alignment Torquing	0%

PSAAM OUTPUT is the source of Link 1 signals. SCA OUTPUT is the source of Link 2 signals.

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POST INSTALLATION CHECKOUT PROCESS SPECIFICATION FOR THE APOLLO GUIDANCE & NAVIGATION SYSTEM BLOCK II-KSC WITH COLOSSUS FLIGHT ROPES

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This specification consists of page 1 to 130 inclusive.

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1.0 INTRODUCTION

1.1 The individual Spacecraft (SC) installed Guidance and Navigation (G&N) System to be checked out per this process specification shall consist of one of each of the following major assemblies; The test requirements herein are based on Colossus Rev 237, Colossus Rev. 249, Colossus II (Comanche Rev 45), and Colossus IIA (Comanche Rev 51) flight ropes.

1 - Optical Unit Assembly

1 - Navigation Base Assembly, Block II

1 - Inertial Measurement Unit (IMU) & PIPA Elect. Assy

1 - Power and Servo Assembly (PSA)

1 - Apollo Guidance Computer Group

1 - G&N Interconnect Harness Assembly

1 - Signal Conditioner Assembly

1 - Display and Control Group (D & C)

1 - Coupling Data Unit

1.2 The G&N System herein shall be identified as a Block II system. The computer contains the program flight ropes in the core rope memory. The test requirements herein are based on Colossus Rev 237, Colossus Rev 249, Colossus II (Comanche Rev 45), and Colossus IIA (Comanche Rev 51) flight ropes.

2.0 SCOPE

2.1 This specification outlines the checkout requirements for the G&N System installed in the Apollo Command Module Spacecrafts and tested in the VAB, MSOB, or on the PAD.

2.2 This document is to be used as technical support for all Block II G&N System test documentation for Command Module spacecraft testing. This document shall be amended by addendum to support applicable hardware, mission or program differences.

6.2.2 CMC Operational Test

NOTE: Verify that IMU STANDBY power (including CMC operate power) is applied, IMU OPERATE Power is not applied. (G&N IMU HTR MN A and MN B breakers engaged, Computer MN A and MN B breakers engaged, IMU MN A and MN B breakers disengaged, G/N Power-IMU switch on LEB Lighting Control Panel in OFF Position).

6.2.2.1 CMC Self-Check.

6.2.2.1.1 On K-148, enter the following:

VERB 36 ENTR Wait 10 seconds. [illegible]
[illegible] seconds.

[illegible] 4/4/70 [illegible]

6.2.2.1.2 Verify the appropriate K-START tape for CM Self-Check Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.2.1.3 Start tape reader.

6.2.2.1.4 When tape reader stops, verify the following on the CRT DSKY display:

R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
R2 = +10538 (tape number)
R3 = -000XX (tape revision number)

6.2.2.1.5 Load E-Memory Program.

6.2.2.1.5.1 Start tape reader.

6.2.2.1.5.2 When tape reader stops, verify R1 displays +00101.

6.2.2.1.6 Initiate Self-Check

6.2.2.1.6.1 Start tape reader.

6.2.2.1.6.2 When R3 = 00002, start tape reader.

6.2.2.1.6.3 When tape reader stops, wait 30 seconds.

6.2.2.2 DSKY Check.

6.2.2.2.1 Start tape reader.

6.2.2.2.2 All the electroluminescent elements (PROG, VERB, NOUN, and Row 1, Row 2, Row 3) shall display the decimal number nine (9). Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's

6.2.2.6.1 Enter the following into K-148:

a. VERB 24 NOUN 02, ENTER
b. 02100 ENTER
c. 33777, ENTER
d. 05112, ENTER
e. VERB 25, NOUN 26, ENTER
f. 04000, ENTER
g. 01500 ENTER
h. 00004 ENTER
i. VERB 30, ENTER

The RESTART lamps on the MDC & LEB DSKY's shall illuminate. The PGNS caution lamps on the MDC & LEB annunciator panels shall illuminate.

6.2.2.6.2 Press the ERROR RESET pushbutton on K-148. The RESTART & PGNS caution lamps shall extinguish.

6.2.2.6.3 Enter VERB 36, into K-148. Press the ENTER pushbutton.

6.2.2.7 Rupt Lock Test

6.2.2.7.1 Enter the following sequence into K-148:

a. VERB 25 NOUN 01 ENTR
b. 02100 ENTR
c. 00004 ENTR
d. 30067 ENTR
e. 01500 ENTR
f. VERB 25 NOUN 26 ENTR
g. 00001 ENTR
h. 01500 ENTR
i. 00004 ENTR
j. VERB 31 ENTR

The RESTART lamps on the MDC and LEB DSKY's shall illuminate. The PGNS caution lamps on the MDC and LEB annunciator panels shall illuminate.

6.2.2.7.2 Press the ERROR RESET pushbutton on K-148: The RESTART & PGNS caution lamps shall extinguish.

6.2.2.7.3 Enter VERB 36 into K-148: Press the ENTER pushbutton.

6.2.2.7.4 Enter the following sequence into the K-Start:

a. VERB 21 NOUN 26 ENTR
b. 04000 ENTR
c. VERB 30 ENTR

The RESTART lamps on the MDC and LEB DSKY's shall illuminate. The PGNS caution lamps on the MDC and LEB annunciator panels shall illuminate.

6.2.2.7.5 Press the ERROR RESET pushbutton on the K-START. The RESTART and PGNS caution lamps shall extinguish.

6.2.2.7.6 Enter VERB 36 into the K-START. Press the ENTR pushbutton.

6.2.2.8 TC Trap Test

6.2.2.8.1 Enter the following sequence into K-148:

a. VERB 21 NOUN 01 ENTR
b. 01470 ENTR
c. 31474 ENTR
d. NOUN 15 ENTR
e. 54067 ENTR ENTR
f. 31475 ENTR ENTR
g. 54001 ENTR ENTR
h. 14712 ENTR ENTR
i. 00067 ENTR
j. VERB 25 NOUN 26 ENTR
k. 35000 ENTR
l. 01470 ENTR
m. 00003 ENTR
n. VERB 30 ENTR

The RESTART lamps on the MDC and LEB DSKY's shall illuminate. The PGNS caution lamps on the MDC and LEB annunciator panels shall illuminate.

6.2.2.8.2 Press the ERROR RESET pushbutton on the K-148. All alarms shall clear.

6.2.2.8.3 Enter VERB 36 ENTR into K-148.

6.2.2.8.4 Enter the following sequence into K-148:

a. VERB 21 NOUN 01 ENTR
b. 01470 ENTR
c. 30067 ENTR
d. NOUN 15 ENTR
e. 31474 ENTR ENTR
f. 22000 ENTR ENTR
g. 22005 ENTR ENTR
h. 01470 ENTR
i. VERB 25 NOUN 26 ENTR
j. 36000 ENTR
k. 01470 ENTR
l. 00003 ENTR
m. VERB 30 ENTR

The RESTART lamps on the MDC and LEB DSKY's shall illuminate. The PGNS caution lamps on the MDC and LEB annunciator panels shall illuminate.

6.2.2.8.5 Press the ERROR RESET pushbutton on the K-148. All alarms shall clear.

6.2.2.8.6 Enter VERB 36 into K-148. Press ENTR pushbutton.

6.2.2.9 Nightwatchman Test

6.2.2.9.1 Enter the following sequence into K-148.

a. VERB 24 NOUN 01 ENTR
b. 02100, ENTR
c. 30001, ENTER
d. 01500, ENTER
e. VERB 25, NOUN 26, ENTR
f. 04000, ENTR
g. 01500, ENTR
h. 00004, ENTR
i. VERB 30, ENTR

The RESTART lamps on the MDC & LEB DSKY's shall illuminate. The PGNS caution lamps on the MDC & LEB annunciator panels shall illuminate.

6.2.2.9.2 Press the ERROR RESET pushbutton on K-148. The RESTART & PGNS caution lamps shall extinguish.

6.2.4 G&N System Power Supplies Test

6.2.4.1 Proceed with this test if 6.2.3, Operate Power On Test, has been completed and system operation has not been interrupted. If system operation has been interrupted, perform 6.2.5.2, Turn On Procedure, before proceeding with this test. Insure that the IMU Operate Power has been on for at least 15 minutes before proceeding with this test.

6.2.4.2 Enter the following sequence into the K-Start. Verb 41 NOUN 20, ENTER; +00000 ENTER; +00000 ENTER; +00000 ENTER.

6.2.4.3 Set/Verify the following circuit breakers and switches on the Right Hand Circuit Breakers Panel and LEB.

a. COMPUTER MN A to ON (pushed in) and COMPUTER MN B to OFF (pulled out).
b. G/N - POWER to AC1
c. IMU HTR MN A to ON (pushed in) and IMU HTR MN B to OFF (pulled out).
d. IMU MN A to ON (pushed in) and IMU MN B to OFF (pulled out).
e. G/N POWER - IMU to IMU
f. OPTICS MN A to ON (pushed in) and OPTICS MN B to OFF (pulled out).
g. G/N POWER - OPTICS to OPTICS

6.2.4.4 Record the voltage indicated on the CRT for the following signals:

a. The +28 VDC IMU OPERATE (Bus No. 1) output voltage shall be +28.8±3 VDC (CG 1500).
b. The +28 VDC IMU STANDBY (Bus No. 2) output voltage shall be +28.8±3 VDC (CG 1510).
c. The +28 VDC CMC OPERATE (Bus No. 3) output voltage shall be +28.8±3 VDC (CG 1520).
d. The +28 VDC OPTX OPERATE (Bus No. 4) output voltage shall be +28.8±3 VDC (CG 1530).
e. The CG 2221, IGA CDU Coarse Error measurement shall be 0.0±0.68V rms.
f. The CG 2251 MGA CDU Coarse Error measurement shall be 0.0±0.68V rms.
g. The CG 2281 OGA CDU Coarse Error measurement shall be 0.0±0.68V rms.

6.2.4.5 Record the voltage indicated on the CRT for the following power supplies:

a. The +120 VDC PIPA Power Supply output voltage shall be 120±6 VDC (CG 1040).
b. The +20 VDC PIPA Power Supply output voltage shall be 20.0±1.2 VDC (CG 1051).
c. The -20 VDC PIPA Power Supply output voltage shall be -20±2 VDC (CG 1052).
d. The -28 VDC Electronics Power Supply output voltage shall be -27.5±6.0 VDC (CG 1100).

6.2.5.2.2 Insure that interfacing system EPS and ECS are turned on and operating properly.

CAUTION: The remaining procedure must be followed in sequence specified. Failure to adhere to this sequence may require recalibration of the inertial components.

6.2.5.2.3 Energize the G&N COMPUTER MN A and MN B breakers on the Right Hand Circuit Breaker panel (breakers pushed in). Press the STBY pushbutton on the DSKY for approximately 3 seconds. Verify +14 and +4 VDC AGC power supply outputs on CRT display. Voltages shall be +14±0.4V (CG 1020) and +4±0.2 (CG1030). On DSKY verify TEMP light is ON.

6.2.5.2.4 Set the G&N POWER AC1 and AC2 breakers on the Right Hand Circuit Breaker Panel to ON (breakers pushed in). Set the G&N POWER AC1-OFF-AC2 switch to AC1.

6.2.5.2.4.1 Set the G&N DSKY and Display Panel brightness to the minimum acceptable level by manipulation of LIGHTS - NUMERICS control on both Left Hand Circuit breaker panel and LEB Lighting Control panel.

6.2.5.2.5 Energize the G&N IMU HTR, MN A and MN B breakers on the Right Hand Circuit Breaker panel (breakers pushed in). Insure that the CMC +28 VDC discrete lamp on the Event Module is illuminated (CG 1523). Verify TEMP light on DSKY is extinguished.

6.2.5.2.5.1 Set/Verify the following switches on the PSAAM.

a. PSAAM PWR to ON
b. INHIBIT VOLTAGE FAIL to OFF.

6.2.5.2.6 Enter VERB 36 ENTER into K148. Press ERROR RESET pushbutton on K148. All computer alarms on the Main Display Console (MDC) and LEB AGC DSKY shall clear. Verify that DSKY R1, R2, R3, VERB, NOUN and PROG indications are blank.

6.2.5.2.7 Verify the appropriate K-START tape for CM Self-Check Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.5.2.8 Start tape reader.

6.2.5.2.9 When tape reader stops, verify the following on the CRT DSKY display:

R1 = +YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
R2 = +10538 (Tape number)
R3 = -000XX (tape revision number)

6.2.5.2.10 Start tape reader.

6.2.6 G&N Operational Test

6.2.6.1 Verify the appropriate K-START tape for CM G&N OPCHK is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.6.1.1 Start tape reader.

6.2.6.1.2 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
b. R2 = +10531 (tape number)
c. R3 = -000XX (tape revision number)

6.2.6.2 E-Memory Program Load and Sum Check.

6.2.6.2.1 Start tape reader.

6.2.6.2.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00101.

6.2.6.3 Local g Measurement.

6.2.6.3.1 Start tape reader.

6.2.6.3.2 In approximately 10 minutes, VERB 06 NOUN 98 shall flash.

6.2.6.3.3 From the CRT DSKY display read and record Row 1 and Row 2 (local gravity whole and fractional, respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.2.6.4 Horizontal Earth Rate Measurement.

6.2.6.4.1 Press PRO pushbutton on DSKY.

6.2.6.4.2 In approximately 2 seconds VERB 06 NOUN 98 shall flash. From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.2.6.5 Enter the following on K-148:

VERB 34	ENTR
VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR

6.2.9 Semi-Automatic Mode Test

6.2.9.1 Verify the appropriate K-START tape for CM Semi-Automatic Mode Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.9.1.1 Start tape reader.

6.2.9.1.2 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
b. R2 = +10530 (tape number)
c. R3 = -000XX (tape revision number)

6.2.9.2 E-Memory Program Load

6.2.9.2.1 Start tape reader.

6.2.9.2.2 When tape reader stops verify the following on CRT DSKY:

R1 = 00101

6.2.9.3 Command Accuracy 0°.

6.2.9.3.1 Start tape reader

6.2.9.3.2 When tape stops verify that CRT DSKY R1 indicates 00201. Wait 15 seconds.

6.2.9.3.3 Read and record CRT IMU Gimbal angles. The indications shall be 000±003 degrees.

6.2.9.3.4 Read and record CRT CDU angle indications. The indications shall be +000.00±001.50.

6.2.9.4 Command Accuracy 45°.

6.2.9.4.1 Start tape reader.

6.2.9.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00301. Wait 5 seconds.

6.2.9.4.3 Read and record CRT IMU Gimbal angles. The indications shall be 045±003 degrees.

6.2.9.4.4 Read and record CRT CDU angle indications. Indications shall be +045.00±001.50.

6.2.9.5 CDU Repeating Accuracy 45°.

6.2.15 IRIG Scale Factor Test

6.2.15.1 Verify the appropriate K-START tape for IRIG Scale Factor Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.15.2 Start tape reader.

6.2.15.2.1 When tape reader stops verify the following on the CRT DSKY display:

a. R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
b. R2 = +00083 (tape number)
c. R3 = -000XX (tape revision number)

6.2.15.2.2 Start tape reader.

6.2.15.2.3 When tape reader stops, wait 20 seconds.

6.2.15.3 E-Memory Program Load.

6.2.15.3.1 Start tape reader.

6.2.15.3.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00000.

6.2.15.4 Test Position Data Load (+X Scale Factor)

6.2.15.4.1 Start tape reader.

6.2.15.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.2.15.4.3 Start tape reader

6.2.15.4.4 When tape reader stops, VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nave Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.4.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.4.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001).

6.2.16 IMU Performance Test. A reference data sheet is provided at the end of this section to aid in data reduction.

6.2.16.1 Insure that IMU Operate power and LGC Operate power has been supplied for a minimum of one hour and that the IMU is not in a Gimbal Lock condition.

6.2.16.2 On CRT, monitor and record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.2.16.3 Verify the appropriate K-START tape for IMU Performance Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.16.4 Start tape reader.

6.2.16.4.1 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
b. R2 = +00081 (tape number)
c. R3 = -000XX (tape revision number)

6.2.16.4.2 Start tape reader.

6.2.16.4.3 When tape reader stops, wait 10 seconds.

6.2.16.5 Start the tape reader. After 15 seconds, verify IMU is coarse aligned to zero degrees.

6.2.16.6 E-Memory Program Load.

6.2.16.6.1 Start the tape reader. When tape reader stops, verify the following DSKY display:

Row 1
Row 3

6.2.16.7 Test Position +00001.

6.2.16.7.1 E-Memory Program and Test Position Matrix Sum Check

6.2.16.7.1.1 Start tape reader.

6.2.16.7.1.2 When tape reader stops, verify DSKY Row 1 displays +00001.

6.2.19 **CMC Voltage Margin Test**

6.2.19.1 Verify that the G&N IMU HTR MNA & MNB circuit breakers are engaged, Computer MNA & MNB breakers are engaged, IMU MNA & MNB circuit breakers are not engaged, and the G&N Power - IMU switch on the LEB Lighting Control Panel is in the OFF position.

6.2.19.2 On the PSA Adapter Module set the INHIBIT VOLTAGE FAIL switch to ON.

CAUTION: During the performance of this test the +4 VDC CMC Power Supply shall not be operated at less than +2.5 VDC or greater than 5.2 VDC (CG 1030). The +14 VDC CMC Power Supply shall not be operated at less than +8.5 VDC or greater than +17.0 VDC (CG 1020). Rotate the LEB LTS NUMERICS SEL to approximately center position. Decrease to absolute minimum discernable lighting.

NOTE: The flashing indication of the CMC Power Supplies on CRT may be disregarded for this test.

6.2.19.3 Into R154 insert 0001. Verify and execute.

6.2.19.3.1 Into R153 insert 1100. Verify and execute.

6.2.19.4 Into C156 insert -040001244. Verify and execute. Verify on the CRT that GV0116 is between -3.0 and -5.0 VDC.

6.2.19.5 Into C156 insert -050001234. Verify and execute. Verify on the CRT that GV0106 is between -4.0 and -6.0 VDC.

6.2.19.6 Into R154 insert 0111. Verify and execute.

6.2.19.7 Observe CG 1020, +14 VDC CMC Power Supply and CG 1030, +4 VDC CMC Power Supply, on the CRT. Repeat 6.2.19.3 through 6.2.19.6 adjusting each C-Start entry until CG 1020 is +12.1 (+0.1, -0.0) VDC and CG 1030 is +3.40 (+0.03 - 0.00) VDC.

6.2.19.8 On K-148, enter the following:

VERB 36 ENTR Wait 10 seconds.

out

6.2.19.9 Verify the appropriate K-START tape for CM Self-Check Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.19.9.1 Start tape reader.

6.2.19.9.2 When tape reader stops, verify the following on the CRT DSKY display

R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
R2 = +10538 (tape number)
R3 = -000XX (tape revision number)

APPENDIX I (Continued)

Signal	Link	Nomenclature	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
CG 3160	1	SCT SHAFT TACK O/P	3.3±1.3 VRMS at Hi Rate	1.1%
CG 3170	1	SCT TRUNNION TACH O/P	0.85±0.35 VRMS at Hi Rate	1.1%
CG 3721	2	SHAFT CDU DAC O/P	10.12±1.00 VRMS at 17°	1%
CG 3722	2	TRUNNION CDU DAC O/P	10.12±1.00 VRMS at 17°	1%
CG 4300	1	CMC TEMP	87.5±42.5° F	0.23%
CG 6020	1	PIPA CAL MODULE TEMP	72.5±27.5° F	0.23%
CG 6021	1	IMU 800 cps 5% TEMP (PSA)	90±30° F	0%
See Page 5				

APPENDIX II

K-START TAPE INFORMATION

NAME	NUMBER*	PROGRAM	R1= YYYYY R1 DISPLAY
CM Self-Check Test	F09C103-K10538-XX	COLOSSUS REV 237	09237
CM G/N OPCHK	F09C103-K10531-XX	↓	09237
CM Semi-Automatic Mode Test	F09C103-K10530-XX		09237
IRIG Scale Factor Test	F09C103-K00083-XX		09237
IMU Performance Test	F09C103-K00081-XX		09237
CM Self-Check Test	F09C104-K10538-XX	COLOSSUS REV 249	09249
CM G/N OPCHK	F09C104-K10531-XX	↓	09249
CM Semi-Automatic Mode Test	F09C104-K10530-XX		09249
IRIG Scale Factor Test	F09C104-K00083-XX		09249
IMU Performance Test	F09C104-K00081-XX		09249
CM Self-Check Test	F11C106-K10538-XX	COLOSSUS II	11045
CM G/N OPCHK	F11C106-K10531-XX	(COMANCHE REV 45)	11045
CM Semi-Automatic Mode Test	F11C106-K10530-XX	↓	11045
IRIG Scale Factor Test	F11C106-K00083-XX		11045
IMU Performance Test	F11C106-K00081-XX		11045
CM Self-Check Test	F11C107-K10538-XX	COLOSSUS IIA	11051
CM G/N OPCHK	F11C107-K10531-XX	(COMANCHE REV 51)	11051
CM Semi-Automatic Mode Test	F11C107-K10530-XX	↓	11051
IRIG Scale Factor Test	F11C107-K00083-XX		11051
IMU Performance Test	F11C107-K00081-XX		11051

*NOTE: Where XX equals the tape revision number.

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1.0 INTRODUCTION

1.1 The individual Spacecraft (SC) installed Guidance and Navigation (G&N) System to be checked out per this process specification shall consist of one of each of the following major assemblies:

1 - Optical Unit Assembly

1 - Navigation Base Assembly, Block II

1 - Inertial Measurement Unit (IMU) & PIPA Elect. Assy

1 - Power and Servo Assembly (PSA)

1 - Apollo Guidance Computer Group

1 - G&N Interconnect Harness Assembly

1 - Signal Conditioner Assembly

1 - Display and Control Group (D & C)

1 - Coupling Data Unit

1.2 The G&N System herein shall be identified as a Block II system. The computer contains the program flight ropes in the core rope memory. The test requirements herein are based on Colossus Rev. 249, and Colossus IIA (Comanche Rev. 55) flight ropes.

2.0 SCOPE

2.1 This specification outlines the checkout requirements for the G&N System installed in the Apollo Command Module Spacecrafts and tested in the VAB, MSOB, or on the PAD.

2.2 This doucment is to be used as technical support for all Block II G&N System test documentation for Command Module spacecraft testing. This document shall be amended by addendum to support applicable hardware, mission or program differences.

6.2.2.5 Uplink and Downlink Checks.

6.2.2.5.1 Enter VERB 36 into K148. Press the ENTER pushbutton, then press RESET pushbutton.

6.2.2.5.2 Enter the following sequence into K148:

a. VERB 25 NOUN 01 ENTER
b. 02100, ENTER
c. 00000, ENTER
d. 77777, ENTER
e. 07254, ENTER
f. VERB 05 NOUN 01, ENTER
g. 02100, ENTER

6.2.2.5.3 CMC Registers R1, R2, and R3 display on the CRT shall indicate 00000, 77777, and 07254, respectively.

6.2.2.5.4 Set/Verify that the UP TLM switch on the Main Display Panel is set to ACCEPT and that the UP TLM switch on the G&N Indicator Control Panel is set to BLOCK.

6.2.2.5.5 Execute the Block Uplink Override R-START to enable data to be sent via K-START. On K-148 insert VERB. Verify that the VERB indications on the DSKY and CRT does not change.

6.2.2.5.6 Set the UP TLM switch on the G&N Indicator Control Panel to ACCEPT. Verify that the BLOCK UPLINK discrete is OFF.

6.2.2.5.7 On K-148 insert VERB 01. Verify that the VERB indication on the DSKY and CRT is 01.

6.2.2.5.8 Set the UP TLM switch on the MAIN DISPLAY Panel to BLOCK. Verify that the BLOCK UPLINK discrete is ON.

6.2.2.5.9 On K-148 insert VERB. Verify VERB indication on the DSKY and CRT does not change.

6.2.2.5.10 Set the UP TLM switch on the MAIN DISPLAY Panel to ACCEPT. Verify that the BLOCK UPLINK discrete is OFF. Remove the Block Uplink Override R-START.

6.2.2.5.11 On K-148 insert VERB 36. Press the ENTER pushbutton.

6.2.2.6 **Alarms and Interrupts Test**

6.2.2.6.1 Verify the appropriate K-START tape for Alarms and Interrupts Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.2.6.2 Start the tape reader.

6.2.2.6.3 When the tape reader stops, verify:

R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II.)
R2 = +10545 (Tape Number)
R3 = -00000 (Tape Revision)

6.2.2.6.4 Start the tape reader.

6.2.2.6.5 When the tape reader stops, verify:

R1 = 00100

6.2.2.7 **Parity Fail Test and Rupt Lock Test**

6.2.2.7.1 **Parity Fail Test**

6.2.2.7.1.1 Start the tape reader.

6.2.2.7.1.2 When the tape reader stops, verify the following:

a. On the DSKY, the RESTART lamp is lit.
b. The PGNS Caution lamp is lit.

6.2.2.7.1.3 On the DSKY press the RSET pushbutton. Verify the RESTART and PGNS Caution lamps are not lit.

6.2.2.7.1.4 Start the tape reader.

6.2.2.7.1.5 When the tape reader stops, verify:

R1 = 00200

6.2.2.7.2 **Rupt Lock Test**

6.2.2.7.2.1 Start the tape reader.

6.2.2.7.2.2 When the tape reader stops, verify the following:

a. The RESTART lamp on the DSKY is lit.
b. The PGNCS Caution lamp is lit.

6.2.2.7.2.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNS Caution lamps are not lit.

6.2.2.7.2.4 Start the tape reader.

6.2.2.7.2.5 When the tape reader stops, verify:

R1 = 00201

6.2.2.7.2.6 Start the tape reader.

6.2.2.7.2.7 When the tape reader stops, verify:

R1 = 00300

6.2.2.8 TC Trap Test

6.2.2.8.1 Start the tape reader.

6.2.2.8.2 When the tape reader stops, verify the following:

a. The RESTART lamp on the DSKY is lit.
b. The PGNS Caution lamp is lit.

6.2.2.8.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNS Caution lamps are not lit.

6.2.2.8.4 Start the tape reader.

6.2.2.8.5 When the tape reader stops, verify:

R1 = 00301

6.2.2.8.6 Start the tape reader.

6.2.2.8.7 When the tape reader stops, verify the following:

a. The RESTART lamp on the DSKY is lit.
b. The PGNS Caution lamp is lit.

6.2.2.8.8 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNS Caution lamps are not lit.

6.2.2.8.9 Start the tape reader.

6.2.2.8.10 When the tape reader stops, verify:

R1 = 00302

6.2.2.8.11 Start the tape reader.

6.2.2.8.12 When the tape reader stops, verify:

R1 = 00400

6.2.2.9 Night Watchman Test

6.2.2.9.1 Start the tape reader.

6.2.2.9.2 When the tape reader stops, verify the following:

a. The RESTART lamp on the DSKY is lit.
b. The PGNS Caution lamp as lit.

6.2.2.9.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNS Caution lamps are not lit.

6.2.2.9.4 Start the tape reader.

6.2.2.9.5 When the tape reader stops, verify:

R1 = 00401

6.2.2.10 CMC Clock Frequency Test

6.2.2.10.1 Insure that CMC operate power has been applied for a minimum of 10 minutes before performing this test.

6.2.2.10.2 Verify that the counter is connected to the 3.2 kc signal on the hardline.

6.2.2.10.3 Insure that the counter has been warming up for a minimum of 30 minutes.

6.2.2.10.4 On the counter.

Set the FUNCTION switch to: MAN START
Set the TIME BASE switch to: 1 μsec TIME UNIT/COUNT
Set the SENSITIVITY control to: CHECK

6.2.2.10.5 Verify proper counter operation.

6.2.2.10.6 Set the FUNCTION switch to REMOTE OR TIME INTERVAL.

6.2.2.10.7 Plug in the Preset unit and set:

MODE switch to PRESET
N switches to 96000.

6.2.2.10.8 Turn SAMPLE RATE control fully clockwise (HOLD). Wait 35 seconds for counter display to fill.

6.2.2.10.9 Start counting by depressing RESET switch on counter.

6.2.2.10.10 After approximately 30 seconds, read and record counter display.

6.2.2.10.11 Repeat steps 6.2.2.10.9 and 6.2.2.10.10 nine times.

6.2.2.10.12 The average of the 10 previous readings shall be 30.000000±0.000060 seconds.

6.2.2.10.13 Insure that the system is not in IMU Operate.

6.2.2.10.14 Perform the following DSKY operations:

VERB 37 ENTR
06 ENTR/ENTR

Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the STBY lamp is lit.

6.2.2.10.15 Repeat steps 6.2.2.10.9 through 6.2.2.10.12.

6.2.2.10.16 Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the STBY lamp is not lit. If the STBY lamp does not extinguish when the PRO pushbutton is pressed, repeatedly press the PRO pushbutton until the STBY lamp does extinguish. Record the number of times it was necessary to press the PRO pushbutton. Not more than three depressions of the PRO pushbutton shall be required to turn the STBY lamp off.

6.2.2.11 Minimum Impulse Controller Input Test.

6.2.2.11.1 Enter the following into the DSKY.

a. VERB 11 NOUN 10, ENTER
b. 00032 ENTER

6.2.2.11.2 Set the Minimum Impulse Controller on the Indicator Control Panel to the following position and observe R1 of the DSKY for the proper indications.

	MIC Position	R1 DSKY Indication
a.	Up	77775
b.	Down	77776
c.	Left	77737
d.	Right	77757
e.	Clockwise	77773
f.	Counterclockwise	77767
g.	Neutral	77777

6.2.2.11.3 Enter VERB 34, ENTER into the DSKY.

6.2.2.12 Mark and Mark Reject pushbutton test.

6.2.2.12.1 On the G&N Indicator Control Panel press and hold MARK pushbutton.

6.2.2.12.2 Observe PROG alarm lamp is lighted.

6.2.2.12.3 Enter the following in K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.2.2.12.4 Observe that DSKY row 1 displays 00040.

6.2.2.12.5 Release MARK pushbutton.

6.2.2.12.6 Observe that DSKY Row 1 displays 00000. Press RSET pushbutton.

6.2.2.12.7 Press and hold the REJECT pushbutton on the G&N Indicator Control Panel.

6.2.2.12.8 Observe PROG alarm lamp is lighted.

6.2.2.12.9 Observe that DSKY Row 1 displays 00100.

6.2.2.12.10 Release the REJECT pushbutton.

6.2.2.12.11 Observe that DSKY Row 1 displays 00000. Press RSET pushbutton.

6.2.2.12.12 On the DSKY perform the following operation:

VERB 36 ENTR

6.2.3 "Operate Power On" Test

6.2.3.1 IMU Operate Power ON

CAUTION: The sequences specified in this test must be adhered to. Deviations may necessitate recalibration of the inertial components.

NOTE: Disregard the GIMBAL LOCK indicator until the completion of Step 6.2.3.1.6.

6.2.3.1.1 The following Command Module switches and circuit breakers shall be in the following state:

Right Hand Circuit Breaker Panel

a. GUIDANCE/NAVIGATION COMPUTER MN A and MN B breakers on (pushed in)

b. GUIDANCE/NAVIGATION IMU HTR MN A and MN B breakers on (pushed in)

c. GUIDANCE/NAVIGATION IMU MN A and MN B breakers off (pulled out)

d. GUIDANCE/NAVIGATION OPTICS MN A and MN B breakers off (pulled out)
LEB Lighting Control Panel

e. G/N Power - IMU set to OFF

f. G/N Power - Optics set to OFF

6.2.3.1.2 Switches and selectors on the G&N Indicator control panel shall be set as follows:

a. OPTICS ZERO to OFF
b. OPTICS MODE to MANUAL
c. OPTICS COUPLING to DIRECT
d. OPTICS SPEED to MED
e. OPTICS TEL TRUN to SLAVE to SXT
f. RETICLE BRIGHTNESS to minimum brightness position

6.2.3.1.3 Adjust the Command Module MDC and LEB Lighting Controls to minimum intensity for proper readout of G&N Displays.

6.2.3.1.4 Set up the ACE analog recorders to monitor the following measurements (set chart speed to 5 mm/sec.):

a. CG 2117 IGA Servo Error In Phase
b. CG 2177 OGA Servo Error In Phase
c. CG 2147 MGA Servo Error In Phase
d. CG 2112 IG IX Resolver Output Sin
e. CG 2172 OG IX Resolver Output Sin
f. CG 2142 MG IX Resolver Output Sin
g. CG 1040 +120 VDC PIPA Supply DC Level

CAUTION: Before proceeding, insure that the G&N System has been operating in the STANDBY MODE (power configuration as defined in 6.2.3.1) for a minimum period of 2 hours. Exceptions to this requirement are noted in 6.2.5.2.9.

CAUTION NOTE: If the requirements of 6.2.3.1.6 are not met, remove IMU operate power immediately by placing the G/N POWER-IMU switch on the LEB Lighting Control Panel to OFF.

6.2.3.1.5 Perform the following sequence:

a. Turn on the IMU MN A and MN B circuit breakers on the Right Hand Circuit Breaker Panel (breakers pushed in).

b. Start Analog Recorders.

c. Place G/N Power - IMU switch on the LEB Lighting Control Panel to IMU (switch toggle up).

6.2.3.1.6 Immediately begin monitoring the following measurements.

a. The IMU Operate Power is +28.8±3 VDC (CG 1500). Verify on CRT.

b. On the recorders, verify that oscillations are not sustained and that a null is achieved within 10 seconds of power application in 6.2.3.1.5. on the following measurements:

CG 2112, IG IX Resolver Output Sin
CG 2142, MG IX Resolver Output Sin
CG 2172, OG IX Resolver Output Sin

6.2.3.1.6 (continued)

c. On the CRT, verify the absence of the +120 VDC PIPA supply (CG 1040) for a period of 90±10 seconds following power application in 6.2.3.1.5. Verify PIPA fail discrete is present during this period. After approximately 100 seconds, the voltage shall read +120±6 Vdc.

d. Stop the analog recorders.

6.2.3.1.7 Insure that the following alarm lamps are not lighted on G&N LEB Display Panel.

a. CMC Warning
b. ISS Warning
c. PGNS Caution

6.2.3.1.8 Verify that the PROG alarm lamp on the DSKY's does not light.

6.2.3.1.9 The OG, IG, and MG CDU angles shall be approximately zero. Verify on CRT.

6.2.3.1.10 Enter the following into K-148:

a. VERB 41 NOUN 20, ENTER
b. +00000, ENTER
c. +00000, ENTER
d. +00000, ENTER

6.2.3.1.11 Verify that the following secondary power supply voltages are not flashing on the CRT display.

SECONDARY POWER SUPPLY VOLTAGES

Meas. No.	Signal
1. CG 1040	+120 VDC PIPA SUPPLY
2. CG 1051	+20 VDC PIPA SUPPLY
3. CG 1052	-20 VDC PIPA SUPPLY
4. CG 1070	+4 VDC CDU SUPPLY
5. CG 1100	-28 VDC ELECTRONICS
6. CG 1020	+14 VDC CMC SUPPLY
7. CG 1030	+4 VDC CMC SUPPLY
8. CG 1201	IMU 28V 800 CPS 1 pct 0 ph
9. CG 1202	IMU 28V 800 CPS 5 pct ph A (-90°)
10. CG 1203	IMU 28V 800 CPS 5 pct ph B (0°)
11. CG 1331	3.2 KC 28V SUPPLY
12. CG 1110	2.5 VDC TM BIAS

6.2.3.1.12 The IMU Platform should not be moved during the Temperature Control Tests. 15 minutes after the application of IMU OPERATE power record PIPA TEMP (CG 2300) displayed on the CRT.

6.2.3.1.13 1 hour after the application of IMU OPERATE power monitor and record PIPA TEMP (CG 2300) every 5 minutes for 30 minutes. Verify that each reading does not deviate from the average of each signal by more than 0.1°F.

6.2.3.1.14 When 2 hours have elapsed since the application of IMU OPERATE power record PIPA TEMP. PIPA TEMP shall be 130.5±1.5°F. PIPA TEMP shall be within 0.5°F of that recorded in 6.2.3.1.12 and 6.2.1.3.8.4.

6.2.3.2 Optics Power ON

6.2.3.2.1 Optics power shall be applied by actuating the G&N OPTICS MN A and OPTICS MN B breakers on the Right Hand Circuit Breaker Panel (breakers pushed in), and placing G/N Power - OPTICS switch on the LEB Lighting Control Panel to ON.

6.2.3.2.2 OPTICS +28 VDC discrete shall be issued (CG 1533). Verify by observing that the OPTICS lamp on Event Module is illuminated. Verify that the +28 VDC OPTX OPERATE BUS (CG 1530) is +28.8±3 VDC. Record the indication on the CRT.

6.2.3.2.3 Verify the following secondary power supply voltages on the CRT are not flashing:

CG 1211	OPTX 28V 800 CPS 1 pct 0 ph
CG 1212	OPTX 800 CPS 5 pct -90 ph

6.2.3.2.3.1 Set/verify OPTICS MODE on the G&N Indicator Control Panel to MAN.

6.2.3.2.3.2 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Indicator Panel to ZERO.

6.2.3.3 IMU Cage Test

6.2.3.3.1 Enter the following into the DSKY:

a. VERB 40 NOUN 20, ENTER (wait 3 seconds)
b. VERB 41 NOUN 20, ENTER
c. +00200, ENTER
d. +00200, ENTER
e. +00200, ENTER

Observe that the NO ATT lamps on the DSKY's light and that CDUX, CDUY, CDUZ on the CRT indicate approximately +00200.

6.2.3.3.2 Set up the Analog Recorder to monitor the following signals:

a. IG 1X Resolver Output Sine (CG 2112)
b. MG 1X Resolver Output Sine (CG 2142)
c. OG 1X Resolver Output Sine (CG 2172)

Start the Analog Recorders.

6.2.3.3.3 On MDC panel 1, press and hold the IMU CAGE switch in the CAGE position. On the Analog Recorder, verify that the 1X Sine signals (CG 2112, CG 2142, and CG 2172) null out at 0.5V rms or less.

6.2.3.3.4 Release the IMU CAGE switch. Disregard any momentary transients on the 1X Resolver Sine signals when the switch is released. Sustained oscillations shall be cause for immediate removal of IMU OPERATE power.

6.2.3.3.5 On the CRT verify that CDUX, CDUY and CDUZ are all between +35850 and +00150.

6.2.3.3.6 Stop the Analog Recorders.

6.2.4 G&N System Power Supplies Test

6.2.4.1 Proceed with this test if 6.2.3, Operate Power On Test, has been completed and system operation has not been interrupted. If system operation has been interrupted, perform 6.2.5.2, Turn On Procedure, before proceeding with this test. Insure that the IMU Operate Power has been on for at least 15 minutes before proceeding with this test.

6.2.4.2 Enter the following sequence into the K-Start. Verb 41 NOUN 20, ENTER; +00000 ENTER; +00000 ENTER; +00000 ENTER.

6.2.4.3 Set/Verify the following circuit breakers and switches on the Right Hand Circuit Breakers Panel and LEB.

a. COMPUTER MN A to ON (pushed in) and COMPUTER MN B to OFF (pulled out).
b. G/N - POWER to AC1
c. IMU HTR MN A to ON (pushed in) and IMU HTR MN B to OFF (pulled out).
d. IMU MN A to ON (pushed in) and IMU MN B to OFF (pulled out).
e. G/N POWER - IMU to IMU
f. OPTICS MN A to ON (pushed in) and OPTICS MN B to OFF (pulled out).
g. G/N POWER - OPTICS to OPTICS

6.2.4.4 Record the voltage indicated on the CRT for the following signals:

a. The +28 VDC IMU OPERATE (Bus No. 1) output voltage shall be +28.8±3 VDC (CG 1500).
b. The +28 VDC IMU STANDBY (Bus No. 2) output voltage shall be +28.8±3 VDC (CG 1510).
c. The +28 VDC CMC OPERATE (Bus No. 3) output voltage shall be +28.8±3 VDC (CG 1520).
d. The +28 VDC OPTX OPERATE (Bus No. 4) output voltage shall be +28.8±3 VDC (CG 1530).
e. The CG 2221, IGA CDU Coarse Error measurement shall be 0.0±0.68V rms.
f. The CG 2251 MGA CDU Coarse Error measurement shall be 0.0±0.68V rms.
g. The CG 2281 OGA CDU Coarse Error measurement shall be 0.0±0.68V rms.

6.2.4.5 Record the voltage indicated on the CRT for the following power supplies:

a. The +120 VDC PIPA Power Supply output voltage shall be 120±6 VDC (CG 1040).
b. The +20 VDC PIPA Power Supply output voltage shall be 20.0±1.2 VDC (CG 1051).
c. The -20 VDC PIPA Power Supply output voltage shall be -20±2 VDC (CG 1052).
d. The -28 VDC Electronics Power Supply output voltage shall be -27.5±6.0 VDC (CG 1100).

6.2.4.6 The following values shall be measured with the guidance reference clock synchronizing input pulse. Record the voltage indicated on the CRT.

a. IMU 28V, 800 CPS 1% 0 deg voltage shall be 28.0±0.6 VAC (CG 1201)
b. IMU 28V, 800 CPS 5% PHA - 90 deg. voltage shall be 28.0±1.4 VAC (CG1202).
c. IMU 28V, 800 CPS 5% PHB 0 deg. voltage shall be 28.0±2.1 VAC (CG 1203).
d. Optics 28V, 800 CPS 1% 0 deg voltage shall be 28.0±0.6 VAC (CG 1211).
e. Optics 28V, 800 CPS 5% - 90 deg voltage shall be 28.0±1.5 VAC (CG 1212).
f. PH Diff IMU 5% 0 deg. -90 deg. (CG 1207) phase difference shall be -90° ±10°.
g. PH Diff Optics 1% IMU 1% (CG 1220) phase difference shall be 0° ±10°.

6.2.4.7 Record the voltages indicated on the CRT for the following power supplies:

a. The +14 VDC CMC Power Supply output voltage shall be +14.0±0.4 VDC (CG 1020).
b. The +4 VDC CMC Power Supply output voltage shall be +4.0±0.2 VDC (CG 1030).
c. The +4 VDC CDU Power Supply output voltage shall be +4.0±0.2 VDC (CG 1070).
d. The +2.50 VDC TM BIAS SUPPLY output voltage shall be +2.50±0.06 VDC (CG 1110).

6.2.4.8 Record the CRT indications for the following measurements:

a. The 28V, 3200 CPS Power Supply feedback output voltage shall be 28.6±0.6V RMS (CG 1331).
b. The phase difference between the 3.2 Kc supply and CMC sync shall be 0° ±10° (CG 1336).
c. The +14 VDC CMC Power Supply rms noise shall be less than 0.2 vrms (CG 1021).
d. The +4 VDC CMC Power Supply rms noise shall be less than 0.2 vrms (CG 1031).

6.2.4.8.1 Enter the following into K-148:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+09000 ENTR
Wait 15 seconds.

6.2.4.9 Set/Verify the following circuit breakers and switches on the Right Hand Circuit Breaker Panel and LEB:

a. G/N POWER-OPTICS to OFF
b. OPTICS MN B to ON (pushed in) and OPTICS MN A to OFF (pulled out)
c. G/N POWER - IMU to OFF
d. IMU MN B to ON (pushed in) and IMU MN A to OFF (pulled out)
e. IMU HTR MN A to OFF (pulled out)
f. G/N - POWER to OFF
g. COMPUTER MN B to ON (pushed in) and COMPUTER MN A to OFF (pulled out)

6.2.4.10 Verify that the +28 VDC CMC OPERATE output voltage is +28.8±3 VDC (CG 1520).

6.2.4.11 Set the G/N - POWER switch on the LEB to AC2. Set the IMU HTR MN B to ON (pushed in). Verify that the +28 VDC IMU STANDBY output voltage is +28.8±3 VDC (CG 1500).

6.2.4.12 Wait until 15 minutes have elapsed since setting G/N POWER - IMU to OFF in 6.2.4.9.c then set the G/N POWER - IMU to IMU. Verify that the +28 VDC IMU OPERATE output voltage is +28.8±3 VDC (CG 1500).

6.2.4.13 Set the G/N POWER - OPTICS to OPTICS. Verify that the +28 VDC OPTX OPERATE output voltage is +28.8±3 VDC (CG 1530).

6.2.4.14 Repeat 6.2.4.5 through 6.2.4.8.

6.2.4.15 Set the following circuit breakers to the position indicated:

a. Set the COMPUTER MN A to ON (pushed in).
b. Set the IMU HTR MN A to ON (pushed in).
c. Set the IMU MN A to ON (pushed in).
d. Set the OPTICS MN A to ON (pushed in).

6.2.4.16 Miscellaneous Checks - The following miscellaneous signals are required to supply data for system evaluation in the event of failure, or for trend analysis of system performance. Record the values displayed on the CRT for the following signals.

a.	CG 4300	CMC Temperature
b.	CG 6020	PIPA Calibration Module Temperature
c.	CG 6021	IMU 800 CPS 5% Temperature

6.2.4.17 Verify and record the following signals displayed on the CRT:

a. +120 VDC PIPA SUP NOISE RMS shall be less than 1.5 VRMS (CG 1042).
b. +20 VDC PIPA SUP NOISE RMS shall be less than 1.0 VRMS (CG 1053)
c. +4 VDC CDU SUP NOISE RMS shall be less than 0.1 VRMS (CG 1071).
d. +28V IMU OPERATE BUS NOISE RMS shall be less than 1.0 VRMS (CG 1501)
e. +28V IMU STANDBY BUS NOISE RMS shall be less than 1.0 VRMS (CG 1511).
f. +28V CMC OPERATE BUS NOISE RMS shall be less than 2.0 VRMS (CG 1521)
g. +28V OPTX OPERATE BUS NOISE RMS shall be less than 2.0 VRMS (CG 1531).

6.2.4.18 The noise peaks of the following signals are demonstrated on the event light when the peaks have a rise time between 2 and 50 μsec and the peak voltage exceeds 5 volts.

6.2.4.18 (continued)

a.	+14V CMC SUPPLY NOISE PEAKS	(CG 1022)
b.	+4V CMC SUPPLY NOISE PEAKS	(CG 1032)
c.	+120 VDC PIPA SUPPLY NOISE PEAKS	(CG 1043)
d.	+4 VDC CDU SUPPLY NOISE PEAKS	(CG 1072)
e.	+28V IMU OPERATE BUS NOISE PEAKS	(CG 1502)
f.	+28V IMU STANDBY BUS NOISE PEAKS	(CG 1512)
g.	+28V CMC OPERATE NOISE PEAKS	(CG 1522)
h.	+28V OPTX OPERATE NOISE PEAKS	(CG 1532)

6.2.4.19 If Optics Testing will not continue, set the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OFF.

6.2.5 General Turn Off and Turn On Procedure

NOTE: The procedure shall be utilized any time after performing 6.2.1, Standby Power On Test and 6.2.3, Operate Power On Test to turn on or turn off the G&N Systems. Appropriate portions of this procedure will be referenced in other tests.

6.2.5.1 Turn Off Procedure.

CAUTION: This procedure must be performed in the sequence specified. Failure to adhere to this sequence may require calibration of the inertial components.

6.2.5.1.1 Enter the following sequence into K-148:

a. VERB 41 NOUN 20, ENTER
b. +00000 ENTR
c. +00000 ENTR
d. +09000 ENTR

Verify that the GIMBAL LOCK indicator on the DSKY'S is illuminated. On the G&N Indicator Control Panel verify PGNS light is ON. On the DSKY verify NO ATT light is ON.

6.2.5.1.2 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the following switches on the G&N Indicator Control Panel to the positions designated.

a. OPTICS ZERO to ZERO
b. OPTICS MODE to MANUAL
c. OPTICS COUPLING to DIRECT
d. OPTICS SPEED to MED
e. OPTICS TEL TRUN to SLAVE to SXT
f. RETICLE BRIGHTNESS to minimum brightness position

6.2.5.1.3 Set the G/N Power - IMU switch on the LEB Lighting Control Panel to OFF and G&N IMU MN A and MN B circuit breakers on the Right Hand Circuit Breaker panel to OFF (breakers pulled out).

6.2.5.1.3.1 On K-148 enter the following:

VERB 21 NOUN 01 ENTR
00034 ENTR
00000 ENTR
Verify GIMBAL LOCK lamp goes out.

6.2.5.1.3.1 (continued)

VERB 21 NOUN 01 ENTR
01036 ENTR
40000 ENTR

Verify that NO ATT indication is OFF.

6.2.5.1.4 Set the G&N Power AC1-OFF-AC2 Switch on the Right Hand Circuit breaker panel to OFF and the G&N POWER AC1 and AC2 circuit breakers to OFF (breakers pulled out).

6.2.5.1.5 Decrease the LIGHTS - NUMERICS controls on both the Left Hand Circuit Breaker panel and the LEB Lighting Control Panel to the minimum brightness - OFF position.

6.2.5.1.6 Set the PSAAM power switch on the PSAAM to OFF.

6.2.5.1.7 Set the IMU HTR MN A and MN B circuit breaker on the Right Hand Circuit Breaker panel to OFF (breakers pulled out).

6.2.5.1.8 Set the G/N POWER - OPTICS switch on the LEB Lighting Control Panel to OFF and G&N OPTICS MN A and MN B breakers on the Right Hand Circuit breaker panel to OFF.

6.2.5.1.9 Set the COMPUTER MN A and MN B Circuit breakers on the Right Hand Circuit Breaker panel to OFF (breakers pulled out).

6.2.5.1.10 Verify that the PTC is supplying inertial components heater power to the G&N System. This will be indicated by the following on the PTC.

a. G&N ON (PTC inhibit) light not illuminated.
b. IMU Temp/heater current meter indicates IMU temperature of 130° ±5°F.

6.2.5.2 Turn ON Procedure

6.2.5.2.1 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set or verify the following G&N Indicator Control Panel switches to the position indicated.

a. CONDITION LAMPS to ON
b. OPTICS ZERO to ZERO
c. OPTICS MODE to MANUAL
d. OPTICS COUPLING to DIRECT
e. OPTICS SPEED to LO
f. OPTICS TEL TRUN to SLAVE to SXT
g. RETICLE BRIGHTNESS to minimum brightness position.

6.2.5.2.2 Insure that interfacing system EPS and ECS are turned on and operating properly.

CAUTION: The remaining procedure must be followed in sequence specified. Failure to adhere to this sequence may require recalibration of the inertial components.

6.2.5.2.3 Energize the G&N COMPUTER MN A and MN B breakers on the Right Hand Circuit Breaker panel (breakers pushed in). Press the STBY pushbutton on the DSKY for approximately 3 seconds. Verify +14 and +4 VDC AGC power supply outputs on CRT display. Voltages shall be +14±0.4V (CG 1020) and +4±0.2 (CG1030). On DSKY verify TEMP light is ON.

6.2.5.2.4 Set the G&N POWER AC1 and AC2 breakers on the Right Hand Circuit Breaker Panel to ON (breakers pushed in). Set the G&N POWER AC1-OFF-AC2 switch to AC1.

6.2.5.2.4.1 Set the G&N DSKY and Display Panel brightness to the minimum acceptable level by manipulation of LIGHTS - NUMERICS control on both Left Hand Circuit breaker panel and LEB Lighting Control panel.

6.2.5.2.5 Energize the G&N IMU HTR, MN A and MN B breakers on the Right Hand Circuit Breaker panel (breakers pushed in). Insure that the CMC +28 VDC discrete lamp on the Event Module is illuminated (CG 1523). Verify TEMP light on DSKY is extinguished.

6.2.5.2.5.1 Set/Verify the following switches on the PSAAM.

a. PSAAM PWR to ON
b. INHIBIT VOLTAGE FAIL to OFF.

6.2.5.2.6 Enter VERB 36 ENTER into K148. Press ERROR RESET pushbutton on K148. All computer alarms on the Main Display Console (MDC) and LEB AGC DSKY shall clear. Verify that DSKY R1, R2, R3, VERB, NOUN and PROG indications are blank.

6.2.5.2.7 Verify the appropriate K-START tape for CM Self-Check Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.5.2.8 Start tape reader.

6.2.5.2.9 When tape reader stops, verify the following on the CRT DSKY display:

R1 = +YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
R2 = +10538 (Tape number)
R3 = -000XX (tape revision number)

6.2.5.2.10 Start tape reader.

6.2.5.2.11 When tape reader stops, verify:

R1 = 00101

6.2.5.2.12 Start tape reader

6.2.5.2.13 Monitor DSKY until R2 (SCOUNT+1) increments twice. If an error is detected, the PROG alarm lamp on the DSKY shall light.

6.2.5.2.14 On K-148, enter the following to turn off Self-Check:

VERB 21 NOUN 27 ENTR
00000 ENTR
VERB 34 ENTR

6.2.5.2.15 NOTE: Allow 2 hours to elapse before proceeding, with the following exceptions:

a. If the G&N System has been in the power off state for less than 5 days with the gimbals in the following positions,

X = 000.00±005.00 deg
Y = 000.00±005.00 deg
Z = 090.00±005.00 deg

or has been in the power off state for less than 12 days with the gimbals in the following positions,

X = 000.00±001.00 deg
Y = 000.00±001.00 deg
Z = 090.00±001.00 deg

and the system has not been moved, allow 15 minutes to elapse before proceeding.

b. If the G&N System has been turned off with the gimbals in the unparked position for less than 2 hours allow a warmup time equal to the time off but not less than 15 minutes to elapse before proceeding.

CAUTION: If the requirements of 6.2.5.2.16 are not met, remove IMU Operate Power immediately by setting the G/N POWER-IMU switch on the LEB Lighting Control Panel to OFF.

After the required warmup time has elapsed set the G&N IMU MN A and MN B circuit breaker on the Right Hand circuit breaker panel to ON (breaker pushed in), and the G/N POWER-IMU switch on the LEB Lighting Control panel to the IMU position (toggle up).

6.2.5.2.16 Immediately begin monitoring the following measurements.

a. On the CRT verify that IMU Operate Power is +28.8±3 VDC (CG 1500).

b. On the meter modules verify that oscillations are not sustained and that a null is achieved within 10 seconds of power application on the following measurements:

CG 2112	IG 1X Resolver Output Sin
CG 2142	MG 1X Resolver Output Sin
CG 2172	OG 1X Resolver Output Sin

c. On the CRT verify the absence of the +120 VDC PIPA Supply (CG 1040) for a period of 90±10 seconds following power application. After approximately 100 seconds, the voltage shall read +120±6 VDC.

6.2.5.2.17 Verify that the PROG alarm lamp on the DSKY's does not light.

6.2.5.2.18 Enter VERB 40, NOUN 20, ENTER into K148. Wait 15 seconds.

6.2.5.2.19 On K-148 enter the following.

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.5.2.20 Set the G&N OPTICS MN A and MN B circuit breakers on the Right Hand Circuit breaker panel to the ON position (breaker pushed in).

6.2.5.2.21 Verify that the CRT indications of the signals in table below are not flashing.

Secondary Power Supply Voltages

Measurement Number	Signal
1. CG 1040	+120 VDC PIPA SUPPLY
2. CG 1051	+20 VDC PIPA SUPPLY
3. CG 1052	-20 VDC PIPA SUPPLY
4. CG 1070	+4 VDC CDU SUPPLY
5. CG 1100	-28 VDC ELECTRONICS
6. CG 1020	+14 VDC CMC SUPPLY
7. CG 1030	+4 VDC CMC SUPPLY
8. CG 1201	IMU 28V 800 CPS 1 pct 0 pha
9. CG 1202	IMU 28V 800 CPS 5 pct ph A
10. CG 1203	IMU 28V 800 CPS 5 pct ph B
11. CG 1331	3.2 KC 28V SUPPLY
12. CG 1110	2.5 VDC TM BIAS

6.2.5.2.22 Monitor the PIPA Display Scope to insure that each PIPA is moding properly.

6.2.5.2.23 Perform 6.2.6 G&N Operational Test.

6.2.6 G&N Operational Test

6.2.6.1 Verify the appropriate K-START tape for CM G&N OPCHK is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.6.1.1 Start tape reader.

6.2.6.1.2 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
b. R2 = +10531 (tape number)
c. R3 = -000XX (tape revision number)

6.2.6.2 E-Memory Program Load and Sum Check.

6.2.6.2.1 Start tape reader.

6.2.6.2.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00101.

6.2.6.3 Local g Measurement.

6.2.6.3.1 Start tape reader.

6.2.6.3.2 In approximately 10 minutes, VERB 06 NOUN 98 shall flash.

6.2.6.3.3 From the CRT DSKY display read and record Row 1 and Row 2 (local gravity whole and fractional, respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.2.6.4 Horizontal Earth Rate Measurement.

6.2.6.4.1 Press PRO pushbutton on DSKY.

6.2.6.4.2 In approximately 2 seconds VERB 06 NOUN 98 shall flash. From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.2.6.5 Enter the following on K-148:

VERB 34	ENTR
VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR

6.2.7 Gimbal Friction Test

6.2.7.1 Enter the following sequence into K-148:

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+17000		ENTR
+17000		ENTR
+17000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+27000		ENTR
+27000		ENTR
+27000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR
Wait 15 seconds		

6.2.7.2 Inner Gimbal Friction Test

6.2.7.2.1 Set up the ACE Analog Recorders to record the following measurements:

a. CG 2120 IG TORQUE MOTOR CURRENT
b. CG 2117 IGA SERVO ERROR IN PHASE
c. CG 2112 IG 1X RESOLVER OUTPUT SIN
d. CG 2113 IG 1X RESOLVER OUTPUT COS
e. CG 2220 IGA CDU FINE ERROR
f. CG 2221 IGA CDU Coarse Error

6.2.7.2.2 Enter the following sequence into K-148: (+360 IG torquing)

VERB 21	NOUN 01	ENTR
02757		ENTR
00000		ENTR
NOUN 15		ENTR
00000		ENTR/ENTR
40000		ENTR/ENTR
40034		ENTR/ENTR
00000		ENTR/ENTR
00000		ENTR

6.2.7.2.3 Enter the following sequence into K-148:

VERB 42	ENTR
VERB 33	ENTR

6.2.7.2.4 Start analog recorders.

6.2.7.2.5 Verify that IG Servo Error Quadrature (CG 2108) is 0.0±1.2V rms. Observe measurement CG 2112, IG 1X Resolver output SIN, on the analog recorder. When steady-state condition occurs, with the reading near zero (approximately 12 minutes), stop the recorders.

6.2.7.2.6 Return the G&N System to the coarse align mode by entering the following sequence in K-148:

VERB 40	NOUN 20	ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+17000		ENTR
+17000		ENTR
+17000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+27000		ENTR
+27000		ENTR
+27000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

6.2.7.2.7 Wait 15 seconds before proceeding.

6.2.7.2.8 Enter the following sequence into K-148: (-360° IG torquing)

VERB 24	NOUN 01	ENTR
02761	ENTR	
37777	ENTR	
37743	ENTR	

6.2.7.2.9 Enter the following sequence into K-148:

VERB 42 ENTR
VERB 33 ENTR

6.2.7.2.10 Start analog recorders.

6.2.7.2.11 Observe measurement CG 2112, IG 1X Resolver output SIN, on the analog recorder. When steady-state condition occurs, with the reading near zero (approximately 12 minutes), stop the recorders.

6.2.7.2.12 Return the G&N System to the coarse align mode by entering the following sequence into K-148:

VERB 40 NOUN 20 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.2.7.2.13 Wait 15 seconds before proceeding.

6.2.7.3 Outer Gimbal Friction Test.

6.2.7.3.1 Set up the ACE Analog Recorders to record the following measurements:

a.	CG 2180	OG TORQUE MOTOR CURRENT
b.	CG 2177	OGA SERVO ERROR IN PHASE
c.	CG 2172	OG 1X RESOLVER OUTPUT SIN
d.	CG 2173	OG 1X RESOLVER OUTPUT COS
e.	CG 2280	OGA CDU FINE ERROR
f.	CG 2281	OGA CDU Coarse Error

6.2.7.3.2 Enter the following sequence into K-148: (+360° OG torquing)

VERB 24	NOUN 01	ENTR
02757	ENTR	
40000	ENTR	
40034	ENTR	

6.2.7.3.3 Enter the following sequence into K-148:

VERB 42	ENTR
VERB 33	ENTR

6.2.7.3.4 Start analog recorders.

6.2.7.3.5 Verify that OG Servo Error Quadrature (CG 2168) is 0.0±1.2V rms. Observe measurement CG 2172, OG 1X Resolver output SIN, on the analog recorder. When steady-state condition occurs, with the reading near zero (approximately 12 minutes), stop the recorders.

6.2.7.3.6 Return the G&N System to the coarse align mode by entering the following sequence into K-148:

VERB 40	NOUN 20	ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+17000		ENTR
+17000		ENTR
+17000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+27000		ENTR
+27000		ENTR
+27000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000	ENTR	
+00000	ENTR	
+00000	ENTR	

6.2.7.3.7 Wait 15 seconds before proceeding.

6.2.7.3.8 Enter the following sequence into K-148: (-360° OG torquing)

VERB 24	NOUN 01	ENTR
02757	ENTR	
37777	ENTR	
37743	ENTR	

6.2.7.3.9 Enter the following sequence into K-148:

VERB 42	ENTR
VERB 33	ENTR

6.2.7.3.10 Start analog recorders.

6.2.7.3.11 Observe measurement CG 2172, OG 1X resolver output SIN, on the analog recorder. When steady-state condition occurs, with the reading near zero (approximately 12 minutes), stop the recorder.

6.2.7.3.12 Return the G&N System to the coarse align mode by entering the following sequence into K-148:

VERB 40	NOUN 20	ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+17000		ENTR
+17000		ENTR
+17000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+27000		ENTR
+27000		ENTR
+27000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000	ENTR	
+00000	ENTR	
-06750	ENTR	

6.2.7.3.13 Wait 15 seconds before proceeding.

6.2.7.4 Middle Gimbal Friction Test.

6.2.7.4.1 Set up the ACE Analog Recorders to record the following measurements

a.	CG 2140	MG TORQUE MOTOR CURRENT
b.	CG 2147	MGA SERVO ERROR IN PHASE
c.	CG 2142	MG 1X RESOLVER OUTPUT SIN
d.	CG 2143	MG 1X RESOLVER OUTPUT COS
e.	CG 2250	MGA CDU FINE ERROR
f.	CG 2251	MGA CDU Coarse Error

6.2.7.4.2 Enter the following sequence into K-148: (+135° MG torquing)

VERB 24	NOUN 01	ENTR
02763	ENTR	
63777	ENTR	
77777	ENTR	

6.2.7.4.3 Entr the following sequence into K-148:

VERB 42	ENTR
VERB 33	ENTR

6.2.7.4.4 Start the analog recorder.

6.2.7.4.5 Verify that MG Servo Error Quadrature (CG 2138) is 0.0±1.2V rms. Observe measurement CG 2142, MG 1X Resolver output SIN, on the analog recorder. When steady-state condition occurs (approximately 5 minutes), stop the recorders.

6.2.7.4.6 Return the G&N System to the coarse align mode by entering the following sequence into K-148:

VERB 40 NOUN 20, ENTR
Wait 15 seconds

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

Wait 15 seconds

VERB 41	NOUN 20	ENTR
+17000		ENTR
+17000		ENTR
+17000		ENTR

Wait 15 seconds

6.2.7.4.6 (continued)

VERB 41	NOUN 20	ENTR
+27000		ENTR
+27000		ENTR
+27000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR
Wait 15 seconds		
+00000	ENTR	
+00000	ENTR	
+06750	ENTR	

6.2.7.4.7 Enter the following sequence into K-148: (-135° MG torquing)

VERB 24	NOUN 01	ENTR
02763	ENTR	
14000	ENTR	
00000	ENTR	

6.2.7.4.8 Enter the following sequence into K-148:

VERB 42 ENTR
VERB 33 ENTR

6.2.7.4.9 Start analog recorders.

6.2.7.4.10 Observe measurement CG 2142, MG 1X Resolver output SIN, on the analog recorder. When the steady-state condition occurs (approximately 5 minutes), stop the recorders.

6.2.7.4.11 Return the G&N System to the coarse align mode by entering the following sequence into K-148:

VERB 40	NOUN 20	ENTR
VERB 41	NOUN 20	ENTR
+00000	ENTR	
+00000	ENTR	
+00000	ENTR	

6.2.7.5 Examine the traces of the recorded measurements for all six phases of this test to detect any sharp discontinuities. Disregard transients of 0.5 second duration or less on the Gimbal Torque motor current traces, disregard transients on the CDU fine error and CDU coarse error measurement traces. The Gimbal Torque motor currents shall not exceed 0.125 ampere. The CDU Fine Error measurements shall not exceed ±70 mv rms. The CDU Coarse Error measurement shall not exceed ±680 mv rms.

6.2.8 G&N Panel Brightness and Lamp Test

6.2.8.1 Proceed with this test if 6.2.5.2 or 6.2.3 has been performed and system operation has not been interrupted. If system operation has been interrupted, perform 6.2.5.2 before proceeding with this test.

6.2.8.2 Rotate the RETICLE BRIGHTNESS thumbwheel on the Control Indicator Panel and verify the capability to control the illumination of the following lamps:

a. SCT reticles
b. SXT reticles
c. Telescope Panel Angle Counters

6.2.8.3 Turn on LIGHTS-INTEGRAL control on Left Hand Circuit Breaker panel and LEB Lighting Control Panel.

6.2.8.4 Adjust the brightness controls on the LEB Lighting Control Panel and Left Hand Circuit Breaker Panel from minimum brightness to maximum brightness. Verify the operation of the G&N Indicator Control Panel lamps and LEB DSKY key lamps. Adjust MDC INTEGRAL lighting control from minimum brightness to maximum brightness and verify illuminations of MDC key lamps.

6.2.8.4.1 Re-adjust brightness controls for minimum acceptable lighting. Turn off LIGHTS-INTEGRAL control on Left Hand Circuit Breaker panel and LEB Lighting Control Panel and MDC INTEGRAL lighting.

6.2.8.5 Push and hold the CONDITION LAMPS switch on the G&N Indicator Control Panel to TEST. Verify the illumination of the following lamps:

a. STAR ACQ
b. MASTER ALARM lamp

6.2.8.6 Set the CONDITION LAMPS switch to ON. Lamps a and b in 6.2.8.5 shall extinguish.

6.2.9 Semi-Automatic Mode Test

6.2.9.1 Verify the appropriate K-START tape for CM Semi-Automatic Mode Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.9.1.1 Start tape reader.

6.2.9.1.2 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
b. R2 = +10530 (tape number)
c. R3 = -000XX (tape revision number)

6.2.9.2 E-Memory Program Load

6.2.9.2.1 Start tape reader.

6.2.9.2.2 When tape reader stops verify the following on CRT DSKY:

R1 = 00101

6.2.9.3 Command Accuracy 0°.

6.2.9.3.1 Start tape reader

6.2.9.3.2 When tape stops verify that CRT DSKY R1 indicates 00201. Wait 15 seconds.

6.2.9.3.3 Read and record CRT IMU Gimbal angles. The indications shall be 000±003 degrees.

6.2.9.3.4 Read and record CRT CDU angle indications. The indications shall be +000.00±001.50.

6.2.9.4 Command Accuracy 45°.

6.2.9.4.1 Start tape reader.

6.2.9.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00301. Wait 5 seconds.

6.2.9.4.3 Read and record CRT IMU Gimbal angles. The indications shall be 045±003 degrees.

6.2.9.4.4 Read and record CRT CDU angle indications. Indications shall be +045.00±001.50.

6.2.9.5 CDU Repeating Accuracy 45°.

6.2.9.5.1 Start the tape reader.

6.2.9.5.2 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.6 Command accuracy 90°.

6.2.9.6.1 Start tape reader.

6.2.9.6.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00501. GIMBAL LOCK lamp will be lighted. Wait 5 seconds.

6.2.9.6.3 Read and record CRT indication of IMU Gimbal angles. The indications shall be 090±003 degrees.

6.2.9.6.4 Read and record CRT CDU angle indications. Indications shall be +090.00±001.50.

6.2.9.7 Command Accuracy 135°.

6.2.9.7.1 Start tape reader.

6.2.9.7.2 When tape reader stops verify CRT DSKY Row 1 indicates 00601. Wait 5 seconds.

6.2.9.7.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 135±003 degrees.

6.2.9.7.4 Read and record CRT CDU angle indications. Indications shall be +135.00±001.50.

6.2.9.8 CDU Repeating Accuracy 135°.

6.2.9.8.1 Start tape reader.

6.2.9.8.2 When tape reader stops verify CRT DSKY Row 1 indicates 00701. Wait 10 seconds, verify GIMBAL LOCK lamp on DSKY is not lighted.

6.2.9.8.3 Start tape reader.

6.2.9.8.4 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 will flash. Read and record CRT DSKY Row 1, 2 and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.9 Plus Gimbal Lock Test.

6.2.9.9.1 Start tape reader.

6.2.9.9.2 When tape reader stops wait approximately 10 seconds. Verify CRT DSKY Row 1 indicates 01101. Verify GIMBAL LOCK lamp is lighted.

6.2.9.10 Command Accuracy 225°.

6.2.9.10.1 Start tape reader.

6.2.9.10.2 When tape reader stops verify CRT DSKY Row 1 indicates 01201. GIMBAL LOCK lamp will be lighted. Wait 15 seconds.

6.2.9.10.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 225±003 degrees.

6.2.9.10.4 Read and record CRT CDU angle indications. Indications shall be +225.00±001.50.

6.2.9.11 ISS CDU Command Rate Test

6.2.9.11.1 Start tape reader.

6.2.9.11.2 When tape reader stops verify CRT DSKY display Row 1 indicates 01301. Wait 10 seconds. Verify IMU Gimbals are at approximately 0° and GIMBAL LOCK lamp is OFF.

6.2.9.11.3 Middle Gimbal Rate Test

6.2.9.11.3.1 Start tape reader.

6.2.9.11.3.2 When tape reader stops immediately verify display of 01401 in Row 1 of CRT DSKY display. In approximately 12 seconds VERB 23 NOUN 26 shall flash. The GIMBAL LOCK lamp shall be lit. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.2.9.11.4 Inner Gimbal Rate Test

6.2.9.11.4.1 Start tape reader.

6.2.9.11.4.2 Approximately 12 seconds after the tape reader stops VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.2.9.11.5 Outer Gimbal Rate Test.

6.2.9.11.5.1 Start tape reader.

6.2.9.11.5.2 Approximately 12 seconds after the tape reader stops VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.2.9.11.6 Start tape reader.

6.2.9.11.6.1 Wait 15 seconds. Verify IMU Gimbals are at approximately 0° and GIMBAL LOCK LAMP is OFF.

6.2.9.12 Command Accuracy 315°.

6.2.9.12.1 Start tape reader.

6.2.9.12.2 When tape reader stops verify CRT DSKY Row 1 indicates 01501.

6.2.9.12.3 Read and record CRT IMU Gimbal Angles. Indication shall be 315±003 degrees.

6.2.9.12.4 Read and record CRT CDU angle indications. Indications shall be +315.00±001.50.

6.2.9.13 CDU Repeating Accuracy 315°.

6.2.9.13.1 Start tape reader.

6.2.9.13.2 Approximately 5 seconds after the tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.14 Minus Gimbal Lock Test.

6.2.9.14.1 Start tape reader.

6.2.9.14.2 When tape reader stops verify CRT DSKY Row 1 indicates 01701. Verify GIMBAL LOCK lamp is lighted after approximately 5 seconds.

6.2.9.15 CDU Repeating Accuracy 225°.

6.2.9.15.1 Start tape reader.

6.2.9.15.2 When tape reader stops verify CRT DSKY Row 1 indicates 02001. Wait 10 seconds before continuing. Verify GIMBAL LOCK lamp is OFF.

6.2.9.15.3 Start tape reader.

6.2.9.15.4 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 will flash. Read and record CRT DSKY Row 1, 2 and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.16 OG CDU Fine Fail Test.

6.2.9.16.1 Start tape reader.

6.2.9.16.2 When tape reader stops verify CRT DSKY Row 1 indicates 02101.

6.2.9.16.3 Start tape reader.

6.2.9.16.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.16.5 Start tape reader.

6.2.9.16.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is OFF. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.17 IG CDU Fine Fail Test

6.2.9.17.1 Start tape reader.

6.2.9.17.2 When tape reader stops verify CRT DSKY Row 1 indicates 02201.

6.2.9.17.3 Start tape reader.

6.2.9.17.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.17.5 Start tape reader.

6.2.9.17.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.18 MG CDU Fine Fail Test.

6.2.9.18.1 Start tape reader.

6.2.9.18.2 When tape reader stops verify CRT DSKY Row 1 indicates 02301.

6.2.9.18.3 Start tape reader.

6.2.9.18.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.18.5 Start tape reader.

6.2.9.18.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.19 **OG CDU Coarse Fail Test**

6.2.9.19.1 Start tape reader.

6.2.9.19.2 When tape reader stops verify CRT DSKY Row 1 indicates 02401.

6.2.9.19.3 Start tape reader.

6.2.9.19.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.19.5 Start tape reader.

6.2.9.19.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.20 **IG CDU Coarse Fail Test**

6.2.9.20.1 Start tape reader.

6.2.9.20.2 When tape reader stops verify CRT DSKY Row 1 indicates 02501.

6.2.9.20.3 Start tape reader.

6.2.9.20.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.20.5 Start tape reader.

6.2.9.20.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.21 **MG CDU Coarse Fail Test**

6.2.9.21.1 Start tape reader.

6.2.9.21.2 When tape reader stops verify CRT DSKY Row 1 indicates 02601.

6.2.9.21.3 Start tape reader.

6.2.9.21.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.21.5 Start tape reader.

6.2.9.21.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.22 Optics CDU Command Rate Test.

6.2.9.22.1 Set the G/N POWER - OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify OPTX BUS, 28V 800∿ 1% and 5% Power Supplies.

6.2.9.22.2 Set the OPTICS COUPLING switch on the G&N Panel to DIRECT. Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +5 degrees of zero as indicated by the TPAC (Telescope Trunnion Slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 20 seconds. Set the OPTICS ZERO switch to OFF. Set the OPTICS MODE switch to CMC.

6.2.9.22.3 Shaft Slew Rate Test.

6.2.9.22.3.1 Start tape reader.

6.2.9.22.3.2 In approximately 25 seconds VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 00018.88000 and 00011.32000.

6.2.9.22.4 Trunnion Slew Rate Test

6.2.9.22.4.1 Start tape reader.

6.2.9.22.4.2 In approximately 15 seconds VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 00004.71000 and 00002.83000.

6.2.9.23 Test Termination

6.2.9.23.1 Start tape reader.

6.2.9.23.2 On the GNIC Panel, set the OPTICS MODE switch to MAN. Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within 5 degrees of zero, as indicated by the TPAC (Telescope Trunnion Slaved to SXT).

6.2.9.23.3 Set the OPTICS ZERO switch to ZERO. Wait 20 seconds. Set the OPTICS MODE switch to CMC.

6.2.9.23.4 Switch the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OFF.

6.2.10 Zero Optics Test

6.2.10.1 Set the G&N POWER-OPTICS switch on the LEB to OPTICS. Verify Power Supplies.

NOTE: Proceed with this test if 6.2.3 Operate Power on test has been completed and system operation has not been interrupted. If system operation has been interrupted perform 6.2.5.2. Turn On Procedure before proceeding.

INITIALIZATION

6.2.10.2 Insure that the following switches on the G&N Indicator Control Panel are set as follows:

a. OPTICS TEL TRUN to SLAVE to SXT
b. OPTICS COUPLING to DIRECT
c. OPTICS SPEED to HI
d. OPTICS MODE to MAN

OPTICS ZERO MODE TEST

6.2.10.3 Monitor the Optics CDU's by entering VERB 16 NOUN 91 ENTER into K-148.

6.2.10.4 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Indicator Control Panel to ZERO. Wait 15 seconds. Verify the Optics have zeroed properly by observing the following on R1 and R2 of the CRT.

a. R1 = +0.00° +0.02°, -0.03° (Shaft Angle)
b. R2 = +0.000° +0.006°, -0.007° (Trunnion Los Angle)

6.2.10.4.1 Enter the following:

VERB 01 NOUN 10, ENTER
00033 ENTER

Verify R1 = XXX6X

6.2.10.4.2 Set the OPTICS ZERO switch to OFF and the OPTICS MODE switch to CMC. Enter the following:

ENTER
00033, ENTER

Verify R1 = XXX5X

6.2.10.4.3 Set the OPTICS MODE switch to MAN. Press the KEY-REL pushbutton.

OPTICS BACKUP MODE TEST

6.2.10.5 Insert the Inflight Tool (V36601405) into the Trunnion Tool input and engage drive mechanism (button out). Verify that the trunnion turns by viewing the movement through the SCT eyepiece while turning the tool until the TPAC reads +5°. Remove the tool from the Trunnion tool input.

6.2.10.6 Insert the Inflight Tool (V36601405) into the Shaft Tool input and engage the drive mechanism (button out). Verify that the Shaft turns by viewing the movement through the SCT eyepiece while turning the tool so that the shaft moves through an angle from 0° to +3° to 0° as indicated on the shaft TPAC. Disengage the shaft drive mechanism (button in) and remove the tool.

6.2.10.7 Insert the Inflight Tool (V36601405) into the Trunnion Tool input. Verify that the Trunnion turns by viewing the movement through the SCT eyepiece while turning the tool so that the trunnion moves from +5° to -5° and back to zero as indicated on the Trunnion TPAC. Disengage the trunnion drive mechanism (button in) and remove the tool.

6.2.11 Optics Coordinate Transformation Control Test.

6.2.11.1 Set the G/N POWER-OPTICS switch on the LEB to OPTICS. Verify Power Supplies.

NOTE: Proceed with this test if 6.2.3 Operate Power On Test has been completed and system operation has not been interrupted. If system operation has been interrupted, perform 6.2.5.2, Turn On Procedure, before proceeding.

INITIALIZATION

6.2.11.2 Verify and/or set the following switches on the G&N Indicator Control Panel to the position indicated.

a. OPTICS TEL TRUN to SLAVE to SXT
b. OPTICS COUPLING to DIRECT
c. OPTICS SPEED to HI
d. OPTICS MODE to MAN

6.2.11.3 Enter the following into K-148:

VERB 16 NOUN 91 ENTR

6.2.11.4 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Panel to ZERO. Wait 15 seconds. Return the OPTICS ZERO switch to OFF.

6.2.11.5 Set up the analog recorders to monitor the following measurements:

a. CG 3170 SCT Trunnion Tachometer Output

RESOLVED MODE PHASING AND IMAGE RATE TEST.

6.2.11.6 Using the OPTICS CONTROL STICK, drive the Optics until R1 = +225.00 and R2 = +10.000 on the CRT and the DSKY's.

6.2.11.7 Set the OPTICS COUPLING switch on the G&N Panel to RSLV and the OPTICS Speed switch to MED.

6.2.11.8 Position the movable optics target such that it is centered on the SCT reticle pattern.

6.2.11.9 Record time. Quickly displace the OPTICS CONTROL STICK 45±10 degrees in the upper right hand quadrant while sighting on the optics target through the SCT eyepiece. The target shall appear to move in the upper right field of view of the SCT at 45±10 deg. When target leaves the SCT upper right field of view press MARK pushbutton. The PROG alarm lamp shall light.

6.2.11.10 From the uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the Shaft CDU register (address 36) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) and the PROG alarm discrete for the period during which the OPTICS CONTROL STICK was being displaced above. The Shaft CDU angle shall be 225.00±10.00 degrees at the time the PROG alarm occurred. The elapsed time from time of OPTICS CONTROL STICK displacement to the time the PROG alarm discrete is obtained shall be 19 to 32 seconds.

6.2.11.11 Set the OPTICS COUPLING switch to DIRECT. Again using the OPTICS CONTROL STICK, drive the optics until R1 = +225.00 and R2 = +10.000. Set the OPTICS COUPLING switch to RSLV.

6.2.11.12 While sighting on the optical target through the SCT eyepiece, displace the OPTICS CONTROL STICK fully to the right. Verify that the target image appears to move in a straight line horizontally to the right and release the OPTICS CONTROL STICK when the target image reaches the edge of the SCT field of view.

6.2.11.13 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS COUPLING switch on the G&N Panel to DIRECT. Set the OPTICS ZERO switch to ZERO.

6.2.12 Optics Functional Test

6.2.12.1 Set/verify the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify the following:

a. +28 VDC OPTX OPERATE BUS (CG 1530) is 28.8±3 VDC. Record the indication on the CRT.

b. CG 1211 OPTX 28V 800 cps 1% 0 ph not flashing on CRT.

c. CG 1212 OPTX 800 cps 5% -90 ph not flashing on CRT.

6.2.12.2 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Insure that the Optics control switches on the G&N Indicator Control Panel are set as follows:

a. OPTICS ZERO to ZERO
b. OPTICS MODE to MAN
c. OPTICS SPEED to LO
d. OPTICS COUPLING to DIRECT
e. OPTICS TRUN to SLAVE to SXT

6.2.12.3 Set OPTICS ZERO switch to OFF.

6.2.12.4 Resolution checks

6.2.12.4.1 SXT Resolution Check - MSO only

6.2.12.4.1.1 Sight through the SXT eyepiece. Using the OPTICS CONTROL STICK adjust the SXT to obtain the best reflected field of view of the 5-inch autocollimator reticle engravings at the center of view.

6.2.12.4.1.2 Note that the autocollimator reticle contains a series of lines of different thickness and width. Each set of lines is marked with a number (20, 15, 10, 7, 5, 3) which indicates the angle subtended by one line and one space. View each set of lines to determine the lowest numbered set in which resolution between lines (ability to distinguish separate distinct lines within a set) can be made. Record the number associated with that set of lines. The SXT resolution shall be at least 10 arc seconds at the center of the field of view.

6.2.12.4.2 SCT Resolution Check

6.2.12.4.2.1 Sight through the SCT EYEPIECE. Using the OPTICS CONTROL STICK adjust the SCT to obtain the best view of the SCT RESOLUTION CHART held in the Optics line of sight.

6.2.12.4.2.2 Note the chart contains sets of lines. View each set of lines to determine the lowest numbered set in which the resolution between lines (ability to distinguish separate lines within a set) can be made. The SCT shall have a resolution of at least 3 arc minutes at the center of the field of view.

6.2.12.5 Slave Telescope Mode Checks

6.2.12.5.1 Verify/perform OPTICS POWER ON TEST per paragraph 6.2.3.2.

6.2.12.5.2 Set/verify following switches on G&N INDICATOR CONTROL PANEL:

a. OPTICS TEL TRUN - SLAVE to SXT
b. OPTICS COUPLING - DIRECT
c. OPTICS SPEED - HI

6.2.12.5.3 Monitor OCDU's by entering VERB 16 NOUN 91, ENTER into K-148.

6.2.12.5.4 Set OPTICS MODE to MAN.

6.2.12.5.5 Using the Optics Hand Controller drive the optics until:

R1 = +000.00±001.00 (SHAFT)
R2 = +10.000±01.000 (TRUNNION)

6.2.12.5.6 Verify on the CRT and Optics Panel:

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = R2 ±0.22 DEG

6.2.12.5.7 Set the OPTICS TEL TRUN on the G&N INDICATOR CONTROL PANEL to 0°.

6.2.12.5.8 Verify:

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = 0.0° ±0.22 DEG

R2 approximately equal to value specified in step 6.2.12.5.5.

6.2.12.5.9 Set the OPTICS TEL TRUN on the G&N INDICATOR CONTROL PANEL to OFFSET 25°.

6.2.12.5.10 Verify on CRT and Optics Panel:

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = 25° ±1.00 DEG
R2 approximately equal to value specified in step 6.2.12.5.5.

6.2.12.5.11 On the G&N INDICATOR CONTROL PANEL set the OPTICS TEL TRUN to SLAVE to SXT.

6.2.12.5.12 Verify on CRT and Optics Panel:

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = R2 ±0.22 DEG

6.2.12.5.13 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). On the G&N INDICATOR CONTROL PANEL set the OPTICS ZERO to ZERO. Wait 15 sec.

6.2.12.5.14 Verify on CRT and OPTICS PANEL.

R1 = 000.00 +000.02, -000.03
R2 = 00.000 +00.006, -00.007

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = R2 ±0.22 DEG

6.2.12.5.15 If Optics testing will not be continued, set the G&N POWER-OPTICS switch on the LEB Lighting Control Panel to OFF.

6.2.12.6 SXT Parallelism Tests

6.2.12.6.1 Remove the plug from the base of the SXT eyepiece and install the Adapter Assembly and Portable Light Assembly. Turn on the light.

NOTE: If needed to reduce external light, place a photographers hood over the optics head.

6.2.12.6.2 SXT Auto Collimator Parallelism Test - MSO only.

6.2.12.6.2.1 Using the OPTICS CONTROL STICK drive the SXT StLOS Trunnion to +15.00° ±2° as indicated in R2 of the DSKY. Maintain a Shaft CDU angle of 000.00±0.10 degrees.

6.2.12.6.2.2 Sight through the 5-inch autocollimator eyepiece and adjust the measurement knob to superimpose the SXT LLOS horizontal reticle image upon the autocollimator horizontal filar. Record the autocollimator reading.

6.2.12.6.2.3 Repeat 6.2.12.6.2.2 twice. Calculate and record the average of the three autocollimator readings.

6.2.12.6.2.4 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO.

6.2.12.6.2.5 Again sight through the 5-inch autocollimator eyepiece and adjust the measurement knob to bring the SXT StLOS horizontal reticle and autocollimator horizontal filar images to coincide. Record the autocollimator reading.

6.2.12.6.2.6 Repeat 6.2.12.6.2.5 twice. Calculate and record the average of the three autocollimator readings. The average value obtained here shall not differ from that obtained in 6.2.12.1 by more than 10 arc seconds.

6.2.12.7 SXT, CMC Functional Check

6.2.12.7.1 Set the OPTICS MODE switch to MAN. Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT).

Set the OPTICS ZERO switch to ZERO. After 15 seconds, return the switch to OFF.

6.2.12.7.2 Sight through the SXT. Using the Control Stick align the SXT StLOS with Optical Target No. 1.

6.2.12.7.3 When aligned, record the value of the Shaft and Trunnion CDU's from the CRT.

6.2.12.7.4 Sight through the SXT. Using the Control Stick align the SXT StLOS with Optical Target No. 2.

6.2.12.7.5 When aligned, record the value of the Shaft and Trunnion CDU's from the CRT.

6.2.12.7.6 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Indicator Control Panel to ZERO. After 15 seconds set the OPTICS ZERO switch to OFF. Set the OPTICS MODE switch to CMC.

6.2.12.7.7 Enter VERB 41, NOUN 91, ENTER into the DSKY. Enter the value for Shaft from 6.2.12.7.3 into the DSKY and press ENTER. Enter the value for Trunnion from 6.2.12.7.3 into the DSKY and press ENTER.

6.2.12.7.8 Sight through the SXT. The StLOS should be approximately centered on the Optical Target No. 1. Record the value of Shaft and Trunnion CDU's from the CRT. The difference between these values and the corresponding values recorded in 6.2.12.7.3 shall be less than 0.06 degrees for the Shaft and 0.02 degrees for the Trunnion. Record the difference.

6.2.12.7.9 Enter VERB 41, NOUN 91, ENTER into the DSKY. Enter the value for Shaft from 6.2.12.7.5 into the DSKY and press the ENTER pushbutton. Enter the value for Trunnion from 6.2.12.7.5 into the DSKY and press the ENTER pushbutton.

6.2.12.7.10 Sight through the SXT. The StLOS should be approximately centered on the Optical Target No. 2. Record the value of Shaft and Trunnion CDU's from the CRT. The difference between these values and the corresponding values recorded in 6.2.12.7.5 shall be less than 0.06 degrees for the Shaft and 0.02 degrees for the Trunnion. Record the difference.

6.2.12.7.11 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds.

6.2.12.7.12 If OPTICS testing will not continue, set the G&N Power Optics switch on the LEB Lighting Panel to OFF.

6.2.13 Optics Slew Rate Test

6.2.13.1 Set/Verify the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify the following signals on the CRT.

a. +28 VDC OPTICS OPERATE BUS (CG 1530) is +29.0±3.0 VDC.
b. OPTX 28V 800 cps 1% 0° ph not flashing on the CRT.
c. OPTX 28V 800 cps 5% -90° ph not flashing on the CRT.

6.2.13.1.1 Verify and/or set the following switches on the G&N Indicator Control Panel to the positions indicated:

a. OPTICS TEL TRUN to SLAVE to SXT
b. OPTICS COUPLING to DIRECT
c. OPTICS SPEED to HI
d. OPTICS MODE to MAN.

6.2.13.2 Monitor the OCDU's by entering VERB 16 NOUN 91, ENTER into K148. Insure RECORD DSKY and RECORD DOWNLINK on R-145 are ON.

6.2.13.3 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Indicator Control Panel to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch on the G&N Indicator Panel to OFF. Set the OPTICS MODE switch to MAN.
TRUNNION SLEW RATE - HI SPEED

6.2.13.4 NOTE: Read and understand the entire step before proceeding. Do not hold Control Stick at upper limit more than 10 seconds or exceed a trunnion angle of 85°.

TRUNNION SLEW RATE - HI SPEED

Record time. Push and hold the Optics Control Stick to its upper limit. After approximately 7 seconds release the control stick. Record the SXT Trunnion Servo Error In-Phase output (CG 3118) and SXT Trun Tach (CG 3150) signals on the CRT while slewing the optics. The CG 3118 shall be -0.25 to -2.00 VRMS. CG 3150 shall be 3.3±1.3 VRMS.

6.2.13.5 Perform the following calculations:
From the Uplink file tape, the compressed data tape,or the PCM tape request a data reduction of the trunnion CDU register (address 35) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 7 second period during which the rate test was being performed.

Calculate the slew rate by dividing the ΔCDU angle by the elapsed time.

The Trunnion slew rate shall be 10.0±2.0 deg/sec.

SHAFT SLEW RATE - HI SPEED

6.2.13.6 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF.

6.2.13.7 NOTE: Read and understand the entire step before proceeding. Do not hold Control Stick at right limit for more than 10 seconds or exceed a shaft angle of 250°.

Record time. Push and hold the Optics Control stick to its right limit. After approximately 7 seconds release the control stick.

Record the SXT Shaft Servo Error In-Phase Output (CG 3117) and SXT Shaft Tach (CG 3140) signals on the CRT while slewing the optics. CG 3117 shall be -0.25 to -2.00 VRMS. CG 3140 shall be 3.3±1.3 VRMS.

6.2.13.8 Perform the following calculations:

From the uplink file tape, the compressed data tape or the PCM tape, request a data reduction of the Shaft CDU register (address 36) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 7 second period during which the rate test was being performed.

Calculate the rate by dividing the ΔCDU angle by the elapsed time.

The Shaft slew rate shall be 19.5±3.9 deg/sec.

TRUNNION SLEW RATE - MED SPEED

6.2.13.9 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF. Set the OPTICS SPEED switch to MED.

6.2.13.10 NOTE: Read and understand the entire step before proceeding. Do not hold control stick at upper limit for more than 20 seconds.

Record time. Push and hold the Optics Control Stick to its upper limit. After approximately 12 seconds release the control stick. Record the SXT TRUN MTR Control Winding (CG 3155) signal while slewing the optics. CG 3155 shall be +0.25 to +2.00 VRMS.

6.2.13.11 Perform the following calculations:

From the uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the Trunnion CDU registers (address 35) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 12 second period during which the rate test was being performed.

Calculate the rate by dividing the ΔCDU angle by the elapsed time.

The trunnion slew rate shall be 1.0±0.2 deg/sec.

SHAFT SLEW RATE - MED SPEED

6.2.13.12 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF.

6.2.13.13 NOTE: Read and understand the entire step before proceeding. Do not hold control stick at right limit for more than 20 seconds.

Record time. Push and hold the Optics Control Stick to its right limit. After approximately 12 seconds release the control stick. Record the SXT Shaft MTR Control Winding (CG 3145) signal while slewing the optics. [illegible] CG 3145 shall be +0.50 to +4.00 VRMS. [illegible] +0.50 to +4.00 VRMS. CG 3140 [illegible]

6.2.13.14 Perform the following calculations:

From the uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the CDU register (address 36) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 12 second period during which the rate test was being performed.

Calculate the rate by dividing the ΔCDU angle by the elapsed time.

The Shaft slew rate shall be 2.0±0.4 deg/sec.

TRUNNION SLEW RATE - LO SPEED

6.2.13.15 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF. Set the OPTICS SPEED switch to LO.

6.2.13.16 NOTE: Read and understand the entire step before proceeding. Do not hold control stick at upper limit for more than 30 seconds.

Record time. Push and hold the Optics Control Stick to its upper limit. After approximately 12 seconds release the control stick.

6.2.13.17 Perform the following calculations:

From the uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the Trunnion CDU register (address 35) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 12 second period during which the rate test was being performed.

Calculate the rate by dividing the ΔCDU angle by the elapsed time.

The Trunnion slew rate shall be 0.10±0.02 deg/sec.

SHAFT SLEW RATE - LO SPEED

6.2.13.18 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF.

6.2.13.19 NOTE: Read and understand the entire step before proceeding. Do not hold control stick at right limit for more than 20 seconds.

Record time. Push and hold the Optics Control Stick to its right limit. After approximately 12 seconds release the control stick.

6.2.13.20 Perform the following calculations:

From the uplink file tape, the compressed data tape, or the PCM tape request data reduction of the CDU register (address 36) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 12 second period during which the rate test was being performed.

Calculate the rate by dividing the ΔCDU angle by the elapsed time.

The Shaft slew rate shall be 0.20±0.04 deg/sec.

OPTICS HAND CONTROLLER DRIFT RATE CHECK - LO SPEED

6.2.13.21 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT.) Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF. Record time. Wait 60 seconds.

6.2.13.22 Perform the following calculations:

From the uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the Trunnion and Shaft CDU registers (addresses 35 and 36 respectively) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 60 second period during which the drift rate test was being performed.

Calculate the drift rate by dividing the ΔCDU angles by the elapsed time.

The Trunnion drift rate shall be less than .0167 deg/sec.

The Shaft drift rate shall be less than .0333 deg/sec.

6.2.13.23 If OPTICS testing will not continue; set the G/N Power-Optics switch on the LEB Lighting Control Panel to OFF.

6.2.14 Stabilization Loop Step Response Test

6.2.14.1 Proceed with this test if the Operate Power On Test of 6.2.3 has been performed and system operation has not been interrupted. If system operation has been interrupted, perform the Turn On Procedure of 6.2.5.2 before proceeding.

6.2.14.2 Insure that the Carry-on Command Stimuli Unit, Model No. C14-200, is installed and connected.

6.2.14.3 Enter VERB 36 into K148. Press the ENTER pushbutton, then the ERROR RESET pushbutton.

6.2.14.4 Inner Gimbal Response Test.

6.2.14.4.1 Enter code 2032000000 in C-START Module. Press the XEQ/SEAL pushbutton to call up CG 2117 IGA SERVO ERROR.

6.2.14.4.2 Enter the following into K148:

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.14.4.3 Wait 15 seconds.

6.2.14.4.4 Enter VERB 40 NOUN 20, ENTER into K148. Wait 15 seconds.

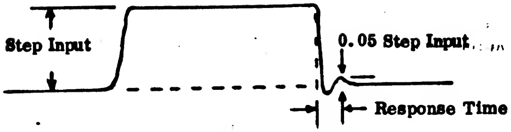
6.2.14.4.5 Deleted.

6.2.14.4.6 Enter 1000 into R155. Verify and execute to enter a DC step into the IG stabilization loop.

CAUTION: If the transient caused by the step input does not settle within 15 seconds, remove the IMU OPERATE power by setting the G/N POWER IMU switch on the LEB Lighting Control Panel to OFF.

6.2.14.4.7 Enter 0000 into R155; the top part of switch should be extinguished. Insure that no other function switches on R155 are illuminated. Start analog recorder. Press the XEQ/SEAL pushbutton to remove the step input to the IG Stabilization Loop. The bottom part of switch shall be extinguished.

6.2.14.4.8 After the transient has settled, stop the analog recorder. Record the loop response time by measuring the time interval between removing the step (initial disturbance) and the settling of the error signal to a value equal to ±5% of the original step amplitude. In addition, record the total number of overshoots. See Figure 2 for typical step input response.



TYPICAL STEP INPUT RESPONSE

FIGURE 2

6.2.14.4.8.1 The inner gimbal stabilization loop response time shall be less than 0.1 second.

6.2.14.4.8.2 The maximum number of overshoots on the IGA Servo Error Signals shall be three.

6.2.14.5 Middle Gimbal Response Test.

6.2.14.5.1 Enter code 2028000000 into C-START MODULE. Press the XEQ/SEAL pushbutton to call up CG 2147 MGA SERVO ERROR.

6.2.14.5.2 Enter the following into K148:

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.14.5.3 Wait 15 seconds.

6.2.14.5.4 Enter VERB 40 NOUN 20 ENTER into K148. Wait 15 seconds.

6.2.14.5.5 Enter 0100 into R155. The top part of switch shall be illuminated. Insure that no other function switches on R155 are illuminated.

6.2.14.5.6 Press XEQ/SEAL pushbutton on R155 to enter a DC step into the MG Stabilization Loop.

CAUTION: If the transient caused by the step input does not settle within 15 seconds, remove the IMU OPERATE power by setting the C/N POWER IMU switch on the LEB Lighting Control Panel to OFF.

6.2.14.5.7 Enter 0000 into R155. The top part of the switch shall be extinguished. Insure that no other function switches on R155 are illuminated. Start analog recorder. Press XEQ/SEAL pushbutton to remove the step inputs to the MG stabilization loop.

6.2.14.5.8 After the transients have settled, stop the analog recorder. Record the loop response time by measuring the time interval between removing the step (initial disturbance) and the settling of the error signal to a value equal to ±5% of the original step amplitude. In addition, record the total number of overshoots.

6.2.14.5.8.1 The middle gimbal stabilization loop response time shall be less than 0.1 second.

6.2.14.5.8.2 The maximum number of overshoots on the MGA Servo Error signals shall be three.

6.2.14.6 Outer Gimbal Response Test.

6.2.14.6.1 Enter code 2026000000 in C-START Module. Press XEQ/SEAL Pushbutton to call up CG 2177 OGA SERVO ERROR.

6.2.14.6.2 Enter the following into K148:

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.14.6.3 Wait 15 seconds.

6.2.14.6.4 Enter VERB 40 NOUN 20, ENTER into K148. Wait 15 seconds.

6.2.14.6.5 Enter 0010 into R155. The top half of the switch shall be illuminated. Insure that no other function switches on R155 are illuminated.

6.2.14.6.6 Press XEQ/SEAL pushbutton on R155 to enter a DC step into the OG Stabilization Loops.

NOTE: If the transient caused by the step input does not settle within 15 seconds, remove the IMU OPERATE power by setting the G/N POWER IMU switch on the LEB Lighting Control Panel to OFF.

6.2.14.6.7 Enter 0000 into R155. The top half of the switch shall be extinguished. Insure that no other function switches on R155 are illuminated. Start analog recorder. Press the XEQ/SEAL pushbutton to remove the step input to the OG Stabilization Loop.

6.2.14.6.8 After the transients have settled out, stop the analog recorder. Record the loop response time by measuring the time interval between removing the step (initial disturbance) and the settling of the error signal to a value equal to ±5% of the original step amplitude. In addition, record the total number of overshoots.

6.2.14.6.8.1 The outer gimbal stabilization loop response time shall be less than 0.1 second.

6.2.14.6.8.2 The maximum number of overshoots on the OGA Servo Error Signals shall be five.

6.2.14.7 Enter VERB 40 NOUN 20 into K148. Press the ENTER pushbutton. Wait 15 seconds.

6.2.14.7.1 Enter the following into K148:

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.14.7.2 Deleted. [illegible]

6.2.15 IRIG Scale Factor Test

6.2.15.1 Verify the appropriate K-START tape for IRIG Scale Factor Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.15.2 Start tape reader.

6.2.15.2.1 When tape reader stops verify the following on the CRT DSKY display:

a. R1 = YYYYY (The value YYYYY is Flight Rope dependent and
is found in Appendix II)
b. R2 = +00083 (tape number)
c. R3 = -000XX (tape revision number)

6.2.15.2.2 Start tape reader.

6.2.15.2.3 When tape reader stops, wait 20 seconds.

6.2.15.3 E-Memory Program Load.

6.2.15.3.1 Start tape reader.

6.2.15.3.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00000.

6.2.15.4 Test Position Data Load (+X Scale Factor)

6.2.15.4.1 Start tape reader.

6.2.15.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.2.15.4.3 Start tape reader

6.2.15.4.4 When tape reader stops, VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nave Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.4.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.4.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001).

6.2.15.5 **Test Position Data Load (+Y Scale Factor)**

6.2.15.5.1 Start tape reader.

6.2.15.5.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.2.15.5.3 Start tape reader.

6.2.15.5.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.5.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.5.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.2.15.6 **Test Position Data Load (+Z Scale Factor).**

6.2.15.6.1 Start tape reader.

6.2.15.6.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.2.15.6.3 Start tape reader.

6.2.15.6.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.6.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.6.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.2.15.7 Test Position Data Load (-X Scale Factor)

6.2.15.7.1 Start tape reader.

6.2.15.7.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.2.15.7.3 Start tape reader.

6.2.15.7.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.7.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.7.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.2.15.8 Test Position Data Load (-Y Scale Factor)

6.2.15.8.1 Start tape reader.

6.2.15.8.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.2.15.8.3 Start tape reader.

6.2.15.8.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTER into K-148 and enter correct azimuth.

6.2.15.8.4 (continued) If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.8.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.8.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.2.15.9 Test Position Data Load (-Z Scale Factor)

6.2.15.9.1 Start tape reader.

6.2.15.9.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.2.15.9.3 Start tape reader.

6.2.15.9.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.9.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.9.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.2.15.10 Test Position Data Load (+X Scale Factor)

6.2.15.10.1 Start tape reader.

6.2.15.10.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.2.15.10.3 Start tape reader.

6.2.15.10.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.10.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.10.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.2.15.11 Test Position Data Load (+Y Scale Factor)

6.2.15.11.1 Start tape reader.

6.2.15.11.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.2.15.11.3 Start tape reader.

6.2.15.11.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.11.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.11.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.2.15.12 **Test Position Data Load (+Z Scale Factor)**

6.2.15.12.1 Start tape reader.

6.2.15.12.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.2.15.12.3 Start tape reader.

6.2.15.12.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.12.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.12.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.2.15.13 **Test Position Data Load (-X Scale Factor)**

6.2.15.13.1 Start tape reader.

6.2.15.13.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.2.15.13.3 Start tape reader.

6.2.15.13.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.13.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.13.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.2.15.14 Test Position Data Load (-Y Scale Factor)

6.2.15.14.1 Start tape reader.

6.2.15.14.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.2.15.14.3 Start tape reader.

6.2.15.14.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.14.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.14.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.2.15.15 Test Position Data Load (-Z Scale Factor)

6.2.15.15.1 Start tape reader.

6.2.15.15.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.2.15.15.3 Start tape reader.

6.2.15.15.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

6.2.15.15.4 (continued) If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.15.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.15.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.2.15.16 Test Position Data Load (+X Scale Factor)

6.2.15.16.1 Start tape reader.

6.2.15.16.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00001.

6.2.15.16.3 Start tape reader.

6.2.15.16.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.16.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.16.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.2.15.17 Test Position Data Load (+Y Scale Factor)

6.2.15.17.1 Start tape reader.

6.2.15.17.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.2.15.17.3 Start tape reader.

6.2.15.17.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX. XX Nav Base Azimuth
R2 = XX. XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.17.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.17.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.2.15.18 Test Position Data Load (+Z Scale Factor)

6.2.15.18.1 Start tape reader.

6.2.15.18.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.2.15.18.3 Start tape reader.

6.2.15.18.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX. XX Nav Base Azimuth
R2 = XX. XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.18.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.18.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.2.15.19 Test Position Data Load (-X Scale Factor)

6.2.15.19.1 Start tape reader.

6.2.15.19.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.2.15.19.3 Start tape reader.

6.2.15.19.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.19.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.19.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.2.15.20 Test Position Data Load (-Y Scale Factor)

6.2.15.20.1 Start tape reader.

6.2.15.20.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.2.15.20.3 Start tape reader.

6.2.15.20.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.20.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.20.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.2.15.21 Test Position Data Load (-Z Scale Factor)

6.2.15.21.1 Start tape reader.

6.2.15.21.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.2.15.21.3 Start tape reader.

6.2.15.21.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.21.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.21.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.2.15.22 Test Position Data Load (+X Scale Factor)

6.2.15.22.1 Start tape reader.

6.2.15.22.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00001.

6.2.15.22.3 Start tape reader.

6.2.15.22.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

6.2.15.22.4 (continued) If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.22.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.22.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.2.15.23 Test Position Data Load (+Y Scale Factor)

6.2.15.23.1 Start tape reader.

6.2.15.23.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.2.15.23.3 Start tape reader.

6.2.15.23.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.23.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.23.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.2.15.24 Test Position Data Load (+Z Scale Factor)

6.2.15.24.1 Start tape reader.

6.2.15.24.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.2.15.24.3 Start tape reader.

6.2.15.24.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.24.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.24.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.2.15.25 Test Position Data Load (-X Scale Factor)

6.2.15.25.1 Start tape reader.

6.2.15.25.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.2.15.25.3 Start tape reader.

6.2.15.25.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.25.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.25.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.2.15.26 Test Position Data Load (-Y Scale Factor)

6.2.15.26.1 Start tape reader.

6.2.15.26.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.2.15.26.3 Start tape reader.

6.2.15.26.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.26.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.26.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.2.15.27 Test Position Data Load (-Z Scale Factor)

6.2.15.27.1 Start tape reader.

6.2.15.27.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.2.15.27.3 Start tape reader.

6.2.15.27.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.27.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.27.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.2.15.28 Terminate this test by entering the following into K-148:

VERB 36	ENTR	Wait 10 seconds.
VERB 41 NOUN 20	ENTR	
+00000	ENTR	
+00000	ENTR	
+00000	ENTR	

6.2.15.29 The four-run average Scale Factor Error for each of the six positions shall be 0 plus or minus 1750 ppm.

6.2.16 IMU Performance Test. A reference data sheet is provided at the end of this section to aid in data reduction.

6.2.16.1 Insure that IMU Operate power and LGC Operate power has been supplied for a minimum of one hour and that the IMU is not in a Gimbal Lock condition.

6.2.16.2 On CRT, monitor and record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.2.16.3 Verify the appropriate K-START tape for IMU Performance Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.16.4 Start tape reader.

6.2.16.4.1 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
b. R2 = +00081 (tape number)
c. R3 = -000XX (tape revision number)

6.2.16.4.2 Start tape reader.

6.2.16.4.3 When tape reader stops, wait 10 seconds.

6.2.16.5 Start the tape reader. After 15 seconds, verify IMU is coarse aligned to zero degrees.

6.2.16.6 E-Memory Program Load.

6.2.16.6.1 Start the tape reader. When tape reader stops, verify the following DSKY display:

Row 1
Row 3

6.2.16.7 Test Position +00001.

6.2.16.7.1 E-Memory Program and Test Position Matrix Sum Check

6.2.16.7.1.1 Start tape reader.

6.2.16.7.1.2 When tape reader stops, verify DSKY Row 1 displays +00001.

6.2.16.7.2 Start tape reader.

6.2.16.7.2.1 When tape reader stops wait 20 seconds.

6.2.16.7.3 Test Initialization.

6.2.16.7.3.1 Start tape reader.

6.2.16.7.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.7.4 Horizontal Drift Test

6.2.16.7.4.1 Start tape reader.

6.2.16.7.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.7.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.7.5 Test Termination.

6.2.16.7.5.1 Start tape reader.

6.2.16.7.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.8 Test Position +00002.

6.2.16.8.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.8.1.1 Start tape reader.

6.2.16.8.1.2 When tape reader stops, verify DSKY Row 1 displays +00002.

6.2.16.8.2 Start tape reader.

6.2.16.8.2.1 When tape reader stops, wait 20 seconds.

6.2.16.8.3 Test Initialization.

6.2.16.8.3.1 Start tape reader.

6.2.16.8.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.8.4 Horizontal Drift Test.

6.2.16.8.4.1 Start tape reader.

6.2.16.8.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.8.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.8.5 PIPA Scale Factor Test.

6.2.16.8.5.1 Start tape reader.

6.2.16.8.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.2.16.8.6 Vertical Drift Test.

6.2.16.8.6.1 Start tape reader.

6.2.16.8.6.2 In approximately 67 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.2.16.8.7 Test Termination.

6.2.16.8.7.1 Start tape reader.

6.2.16.8.7.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.9 Test Position +00003.

6.2.16.9.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.9.1.1 Start tape reader.

6.2.16.9.1.2 When tape reader stops, verify DSKY Row 1 displays +00003.

6.2.16.9.2 Start tape reader.

6.2.16.9.2.1 When tape reader stops, wait 20 seconds.

6.2.16.9.3 Test Initialization.

6.2.16.9.3.1 Start tape reader.

6.2.16.9.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.9.4 Horizontal Drift Test

6.2.16.9.4.1 Start tape reader.

6.2.16.9.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.9.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.9.5 Test Termination.

6.2.16.9.5.1 Start tape reader.

6.2.16.9.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.10 Test Position +00004.

6.2.16.10.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.10.1.1 Start tape reader.

6.2.16.10.1.2 When tape reader stops, verify DSKY Row 1 displays +00004.

6.2.16.10.2 Start tape reader.

6.2.16.10.2.1 When tape reader stops, wait 20 seconds.

6.2.16.10.3 Test Initialization.

6.2.16.10.3.1 Start tape reader.

6.2.16.10.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.10.4 Horizontal Drift Test.

6.2.16.10.4.1 Start tape reader.

6.2.16.10.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.10.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.2.16.10.5 PIPA Scale Factor Test.

6.2.16.10.5.1 Start tape reader.

6.2.16.10.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.2.16.10.6 Vertical Drift Test.

6.2.16.10.6.1 Start tape reader.

6.2.16.10.6.2 In approximately 67 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.2.16.10.7 Test Termination.

6.2.16.10.7.1 Start tape reader.

6.2.16.10.7.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.11 Test Position +00005.

6.2.16.11.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.11.1.1 Start tape reader.

6.2.16.11.1.2 When tape reader stops, verify DSKY Row 1 displays +00005.

6.2.16.11.2 Start tape reader.

6.2.16.11.2.1 When tape reader stops, wait 20 seconds.

6.2.16.11.3 Test Initialization.

6.2.16.11.3.1 Start tape reader.

6.2.16.11.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.11.4 PIPA Scale Factor Test

6.2.16.11.4.1 Start tape reader. Record time.

6.2.16.11.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM and GIMBAL LOCK lamps shall be lit.

6.2.16.11.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.2.16.11.5 Test Termination.

6.2.16.11.5.1 Start tape reader.

6.2.16.11.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.12 Test Position +00006.

6.2.16.12.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.12.1.1 Start tape reader.

6.2.16.12.1.2 When tape reader stops, verify DSKY Row 1 displays +00006.

6.2.16.12.2 Start tape reader.

6.2.16.12.2.1 When tape reader stops, wait 20 seconds.

6.2.16.12.3 Test Initialization.

6.2.16.12.3.1 Start tape reader.

6.2.16.12.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.12.4 PIPA Scale Factor Test.

6.2.16.12.4.1 Start tape reader. Record time.

6.2.16.12.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM and GIMBAL LOCK lamps shall be lit.

6.2.16.12.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.2.16.12.5 Test Termination.

6.2.16.12.5.1 Start tape reader.

6.2.16.12.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.13 Test Position +00007.

6.2.16.13.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.13.1.1 Start tape reader.

6.2.16.13.1.2 When tape reader stops verify DSKY Row 1 displays +00007.

6.2.16.13.2 Start tape reader.

6.2.16.13.2.1 When tape reader stops, wait 20 seconds.

6.2.16.13.3 Test Initialization.

6.2.16.13.3.1 Start tape reader.

6.2.16.13.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.13.4 Horizontal Drift Test.

6.2.16.13.4.1 Start tape reader.

6.2.16.13.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.13.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.2.16.13.5 Test Termination.

6.2.16.13.5.1 Start tape reader.

6.2.16.13.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.14 Test Position +00008.

6.2.16.14.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.14.1.1 Start tape reader.

6.2.16.14.1.2 When tape reader stops, verify DSKY Row 1 displays +00008.

6.2.16.14.2 Start tape reader.

6.2.16.14.2.1 When tape reader stops, wait 20 seconds.

6.2.16.14.3 Test Initialization.

6.2.16.14.3.1 Start tape reader.

6.2.16.14.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.14.4 Horizontal Drift Test

6.2.16.14.4.1 Start tape reader.

6.2.16.14.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish

6.2.16.14.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.14.5 Test Termination.

6.2.16.14.5.1 Start tape reader.

6.2.16.14.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.15. Test Position +00009.

6.2.16.15.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.15.1.1 Start tape reader.

6.2.16.15.1.2 When tape reader stops, verify DSKY Row 1 displays +00009.

6.2.16.15.2 Start tape reader.

6.2.16.15.2.1 When tape reader stops, wait 20 seconds.

6.2.16.15.3 Test Initialization.

6.2.16.15.3.1 Start tape reader.

6.2.16.15.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.15.4 Horizontal Drift Test.

6.2.16.15.4.1 Start tape reader.

6.2.16.15.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.15.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.15.5 Test Termination

6.2.16.15.5.1 Start tape reader.

6.2.16.15.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.16 Test Position +00010.

6.2.16.16.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.16.1.1 Start tape reader.

6.2.16.16.1.2 When tape reader stops, verify DSKY Row 1 displays +00010.

6.2.16.16.2 Start tape reader.

6.2.16.16.2.1 When tape reader stops, wait 20 seconds.

6.2.16.16.3 Test Initialization.

6.2.16.16.3.1 Start tape reader.

6.2.16.16.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.16.4 Horizontal Drift Test.

6.2.16.16.4.1 Start tape reader.

6.2.16.16.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.16.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.16.5 Test Termination.

6.2.16.16.5.1 Start tape reader.

6.2.16.16.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.17 Test Position +00011.

6.2.16.17.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.17.1.1 Start tape reader.

6.2.16.17.1.2 When tape reader stops, verify DSKY Row 1 displays +00011.

6.2.16.17.2 Start tape reader.

6.2.16.17.2.1 When tape reader stops, wait 20 seconds.

6.2.16.17.3 Test Initialization.

6.2.16.17.3.1 Start tape reader.

6.2.16.17.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.17.4	Horizontal Drift Test.
6.2.16.17.4.1	Start tape reader.
6.2.16.17.4.2	When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.
6.2.16.17.4.3	In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).
6.2.16.17.5	PIPA Scale Factor Test.
6.2.16.17.5.1	Start tape reader.
6.2.16.17.5.2	In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).
6.2.16.17.6	Test Termination.
6.2.16.17.6.1	Start tape reader.
6.2.16.17.6.2	When tape reader stops, wait 10 seconds before continuing.
6.2.16.18	Test Position +00012.
6.2.16.18.1	E-Memory Program and Test Position Matrix Sum Check
6.2.16.18.1.1	Start tape reader.
6.2.16.18.1.2	When tape reader stops, verify DSKY Row 1 displays +00012.
6.2.16.18.2	Start tape reader.
6.2.16.18.2.1	When tape reader stops, wait 20 seconds.
6.2.16.18.3	Test Initialization.
6.2.16.18.3.1	Start tape reader.
6.2.16.18.3.2	When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

6.2.16.18.3.2 (continued) If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24 ENTR
XXX.XX (Correct Nav Base Azimuth ±0.5 deg)
XX.XXX (Correct Site Latitude)

6.2.16.18.4 Horizontal Drift Test.

6.2.16.18.4.1 Start tape reader.

6.2.16.18.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.18.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.18.5 PIPA Scale Factor Test.

6.2.16.18.5.1 Start tape reader.

6.2.16.18.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXX. and .XXXXX cm/sec/sec).

6.2.16.18.6 Test Termination.

6.2.16.18.6.1 Start tape reader.

6.2.16.18.6.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.19 Test Position +00013.

6.2.16.19.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.19.1.1 Start tape reader.

6.2.16.19.1.2 When tape reader stops, verify DSKY Row 1 displays +00013.

6.2.16.19.2 Start tape reader.

6.2.16.19.2.1 When tape reader stops, wait 20 seconds.

6.2.16.19.3 Test Initialization.

6.2.16.19.3.1 Start tape reader.

6.2.16.19.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.19.4 Horizontal Drift Test.

6.2.16.19.4.1 Start tape reader.

6.2.16.19.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.19.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.19.5 Test Termination.

6.2.16.19.5.1 Start tape reader.

6.2.16.19.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.20 On CRT, record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.2.16.21 On K-148, enter the following sequence:

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

6.2.16.22 Calculations.

NOTE: Use Post Vibration or System Test data points only.

6.2.16.22.1 **Y PIPA Data Correction Calculation.**

6.2.16.22.1.1 From the uplink file tape, the compressed data tape or the PCM tape, request a data reduction of the X and Z accelerometer ΔV counts (addresses 37 and 41, respectively) and the TIME 2 and TIME 1 registers (addresses 24 and 25, respectively) for the period during which the Y PIPA test was being performed in Positions 5 and 6 of the IMU Performance Test.

6.2.16.22.1.2 Perform the following calculations for Position 5.

$G'_5 = (G_5/\cos \theta y_5)$

where:

G_5 = Measured acceleration term (line 1)

G'_5 = Corrected acceleration term

$\cos \theta y_5 = 1 - (\theta^2 y_5/2)$ for small angles

$\theta y_5 = \sqrt{\theta^2{}_{x5} + \theta^2{}_{z5}}$

and:

$\theta_{z5} = (\Delta V_{x5} - \Delta V_x \text{ Bias})(\text{S.F.}_x)/(\Delta T)(\text{local g})$

$\theta_{x5} = (\Delta V_{z5} - \Delta V_z \text{ Bias})(\text{S.F.}_z)/(\Delta T)(\text{local g})$

and:

$\Delta V_x \text{ Bias} = (\text{X PIPA Bias})(\Delta T)/\text{S.F.}_x$

$\Delta V_z \text{ Bias} = (\text{Z PIPA Bias})(\Delta T)/\text{S.F.}_z$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.2.16.22.1.3 Perform the following calculations for Position 6.

$G'_6 = (G_6/\text{Cos}\ \theta y_6)$

where:

G_6 = Measured acceleration term (line j)

G'_6 = Corrected acceleration term

$\text{Cos}\ \theta y_6 = 1 - (\theta^2 y_6/2)$ for small angles

$$\theta y_6 = \sqrt{\theta^2_{x6} + \theta^2_{z6}}$$

and:

$$\theta_{z6} = (\Delta V_{x6} - \Delta V_x \text{ Bias})(\text{S.F.}_x) / (\Delta T)(\text{local g})$$

$$\theta_{x6} = (\Delta V_{z6} - \Delta V_z \text{ Bias})(\text{S.F.}_z) / (\Delta T)(\text{local g})$$

and:

$$\Delta V_x \text{ Bias} = (\text{X PIPA Bias})(\Delta T)/\text{S.F.}_x$$

$$\Delta V_z \text{ Bias} = (\text{Z PIPA Bias})(\Delta T)/\text{S.F.}_z$$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.2.16.22.2 Obtain data from last IRIG and/or PIPA Test and fill in Data Sheet x_{1-1}.

6.2.16.22.3 Obtain data from second last IRIG and/or PIPA Test and fill in Data Sheet x_{1-2}.

6.2.16.22.4 Obtain data from third last IRIG and/or PIPA Test and fill in Data Sheet x_{1-3}.

6.2.16.22.5 Perform the following calculations for each item appearing on Data Sheet x_i.

NOTE: See Paragraph 5.5 before continuing.

$$D_1 = \left| x_{i-1} - x_i \right|$$

$$D_2 = \left| x_{i-1} - x_i \right| + \left| x_{i-2} - x_{i-1} \right|$$

$$D_3 = \left| x_{i-3} - x_{i-2} \right| + \left| x_{i-2} - x_{i-1} \right| + \left| x_{i-1} - x_i \right|$$

DATA SHEET

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.2.16. 7.4.3	+N BDY - ADOAY Position +00001	meru/g	( ) ___.__	a
6.2.16. 8.4.3	+N BDZ - ADOAZ Position +00002	meru/g	( ) ___.__	b
6.2.16. 8.5.2	-X PIPA Test Position +00002	cm/sec^2	( ) 0 0___. ( ) _____	c
6.2.16. 8.6.2	-N BDX + ADIAX Position +00002	meru/g	( ) ___.__	d
6.2.16. 9.4.3	+N BDX - ADOAX Position +00003	meru/g	( ) ___.__	e
6.2.16. 10.4.3	+N BDY + ADSRAY Position +00004	meru/g	( ) ___.__	f
6.2.16. 10.5.2	-Z PIPA Test Position +00004	cm/sec^2	( ) 0 0___. ( ) _____	g
6.2.16. 10.6.2	+N BDZ + ADIAZ Position +00004	meru/g	( ) ___.__	h
6.2.16 11.4.3	+Y PIPA Test Position +00005	cm/sec^2	( ) 0 0 ___. ( ) _____	i

DATA SHEET (continued)

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.2.16. 12.4.3	-Y PIPA Test Position +00006	cm/sec^2	( ) 0 0 ___ . ( ) _____	j
6.2.16 13.4.3	-NBDX + .707 (ADSRAX - ADOAX) Position +00007	meru/g	( ) ___ . __	k
6.2.16. 14.4.3	-.707 (NBDZ+NBDY) +0.5 (ADIAZ-ADIAY) +0.5 (ADSRAY + ADSRAZ) Position +00008	meru/g	( ) ___ . __	l
6.2.16. 15.4.3	-NBDZ + .707 (ADSRAZ-ADOAZ) Position +00009	meru/g	( ) ___ . __	m
6.2.16 16.4.3	.707 (NBDY-NBDX) +0.5 (ADIAY-ADIAX) +0.5 (ADSRAX) + 0.5 (ADOAY) Position +00010	meru/g	( ) ___ . __	n
6.2.16 17.4.3	-NDBX - ADOAX Position +00011	meru/g	( ) ___ . __	o
6.2.16. 17.5.2	+Z PIPA Test Position +00011	cm/sec^2	( ) 0 0 ___ . ( ) _____	p
6.2.16. 18.4.3	+NBDY + ADOAY Position +00012	meru/g	( ) ___ . __	q
6.2.16. 18.5.2	+X PIPA Test Position +00012	cm/sec^2	( ) 0 0 ___ . ( ) _____	r
6.2.16. 19.4.3	+NBDZ + ADOAZ Position +00013	meru/g	( ) ___ . __	s

DATA SHEET

CALCULATION	PARAMETER	UNITS	
$\frac{\text{line a + line q}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDY - ADOAY + NBDY + ADOAY}}{2}$ Transfer result to line ao	NBDY	meru	t
$\frac{\text{line q - line a}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDY + ADOAY - (NBDY - ADOAY)}}{2}$	ADOAY	meru/g	u
$\frac{\text{line b + line s}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDZ - ADOAZ + NBDZ + ADOAZ}}{2}$ Transfer result to line ap	NBDZ	meru	v
$\frac{\text{line s - line b}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDZ + ADOAZ - (NBDZ - ADOAZ)}}{2}$	ADOAZ	meru/g	w
$\frac{\text{line e - line o}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDX - ADOAX - (-NBDX - ADOAX)}}{2}$ Transfer result to line aq	NBDX	meru	x
$\frac{\text{line e + line o}}{2} \times (-1) = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDX - ADOAX - NBDX - ADOAX}}{2} \times (-1)$	ADOAX	meru/g	y

DATA SHEET (continued)

CALCULATION	PARAMETER	UNITS	
line d + line x = ( ) ___.__ (-NBDX + ADIAX) + NBDX Transfer result to line au	ADIAX	meru/g	z
line f - line t = ( ) ___.__ (+NBDY + ADSRAY) - NBDY Transfer result to line ar	ADSRAY	meru/g	aa
line h - line v = ( ) ___.__ (+NBDZ + ADIAZ) - NBDZ Transfer result to line av	ADIAZ	meru/g	ab
[line k + line x + .707 line y] x 1.414 [-NBDX + .707 ADSRAX -.707 ADOAX + NBDX + .707 ADOAX] x 1.414 Transfer results to line at	ADSRAX	meru/g	ac
(line m + line v + line w) x 1.414 [-NBDZ + .707(ADSRAZ-ADOAZ) + NBDZ + .707 ADOAZ] x 1.414 Transfer results to line as	ADSRAZ	meru/g	ad
(line n - .707 line t + .707 line x + 0.5 line z - 0.5 line ac - 0.5 line u) x 2 [.707(NBDY-NBDX) + 0.5(ADIAY-ADIAX) +0.5 ADSRAX + 0.5 ADOAY -.707 NBDY + .707 NBDX + 0.5 ADIAX -0.5 ADSRAX - 0.5 ADOAY] x 2 Transfer results to line aw.	ADIAY	meru/g	ae
line r - line c = ( )	PIPA X2G	cm/sec^2	af
line i - line j = ( )	PIPA Y2G	cm/sec^2	ag
line p - line g = ( )	PIPA Z2G	cm/sec^2	ah

DATA SHEET (continued)

CALCULATION	PARAMETER	UNITS	
1958.48 — line af x 1 cm/sec pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ax.	X PIPA S. F.	cm/sec/ pulse	ai
1958.48 — line ag x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ay.	Y PIPA S. F.	cm/sec/ pulse	aj
1958.48 — line ah x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer to line az.	Z PIPA S. F.	cm/sec pulse	ak
1/2 (line r + line c) = ( )__ . ___ Transfer results to line ba.	X PIPA Bias	cm/sec^2	al
1/2 (line i + line j) = ( )__ . ___ Transfer results to line bb.	Y PIPA Bias	cm/sec^2	am
1/2 (line p + line g) = ( )__ . ___ Transfer results to line bc.	Z PIPA Bias	cm/sec^2	an

DATA SHEET (x_i)

PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
NBDY	meru	-15		+15			ao
NBDZ	meru	-15		+15			ap
NBDX	meru	-15		+15			aq
ADSRAY	meru/g	-40		+40			ar
ADSRAZ	meru/g	-40		+40			as
ADSRAX	meru/g	-40		+40			at
ADIAX	meru/g	-100		+100			au
ADIAZ	meru/g	-100		+100			av
ADIAY	meru/g	-100		+100			aw
X PIPA S.F. error from line ai	PPM	-1900		+1900			ax
Y PIPA S.F. error from line aj	PPM	-1900		+1900			ay
Z PIPA S.F. error from line ak	PPM	-1900		+1900			az
X PIPA Bias from line al	cm/sec^2	-3.1		+3.1			ba
Y PIPA Bias from line am	cm/sec^2	-3.1		+3.1			bb
Z PIPA Bias from line an	cm/sec^2	-3.1		+3.1			bc

DATA SHEET

PARAMETER	UNITS	D_1	MAX	D_2	MAX	D_3	MAX
NBDY	meru		6.0		9.0		11.0
NBDZ	meru		6.0		9.0		11.0
NBDX	meru		6.0		9.0		11.0
ADSRAY	meru/g		14.0		21.0		25.0
ADSRAZ	meru/g		14.0		21.0		25.0
ADSRAX	meru/g		14.0		21.0		25.0
ADIAX	meru/g		17.0		33.0		40.0
ADIAZ	meru/g		17.0		33.0		40.0
ADIAY	meru/g		17.0		33.0		40.0
X PIPA S.F. error	PPM		400		500		600
Y PIPA S.F. error	PPM		400		500		600
Z PIPA S.F. error	PPM		400		500		600
X PIPA Bias	cm/sec^2		0.50		0.70		0.90
Y PIPA Bias	cm/sec^2		0.50		0.70		0.90
Z PIPA Bias	cm/sec^2		0.50		0.70		0.90

DATA SHEET (x_{1-1})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET (x_1-2)

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET (x_{1-3})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S.F. error	PPM	
Y PIPA S.F. error	PPM	
Z PIPA S.F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

6.2.17 SXT-NB-IMU Fine Align Test (see Table III, Section 5)

6.2.18 Gyro Compassing Test

6.2.18.1 Set the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify that +28 vdc OPTICS OPERATE BUS (CG 1530) is +28.0±3.0 vdc. Verify that the OPTX 28V 800 cps 1% 0° (CG 1211) and OPTX 28V 800 cps 5% -90° (CG 1212) are not flashing in the CRT.

6.2.18.2 Enter the following into the CMC:

VERB 37 ENTER 01 ENTER

6.2.18.3 When PROG display changes to 02, record time as T_0.

6.2.18.4 Gyro Compassing Accuracy

6.2.18.4.1 Wait 120 minutes from T_0. Record Inner, Middle and Outer Gimbal CDU readings every 5 minutes for the next 2 hours.

6.2.18.4.2 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO.

6.2.18.4.3 Enter VERB 65, ENTER into DSKY.
Observe the PROG display on the DSKY change to 03.

6.2.18.4.4 When VERB 06 NOUN 41 flashes on the DSKY, insure R1 and R2 display Target 1 azimuth and elevation.

a. R1 = +XXX.XX (Target 1 azimuth)
b. R2 = +XX.XXX (Target 1 elevation)
c. R3 = 00001

6.2.18.4.5 Verify the data appearing in R1 and R2 and if correct, proceed. If not correct, perform the following sequence:

a. VERB 24, ENTER
b. +XXX.XX, ENTER (Target 1 azimuth)
c. ±XX.XXX, ENTER (Target 1 elevation)

6.2.18.4.6 After the correct readings for R1 and R2 are verified, enter VERB 33, ENTER into the DSKY.

6.2.18.4.7 When VERB 06 NOUN 41 flashes on the DSKY, insure that R1 and R2 display Target 2 azimuth and elevation.

a. R1 = XXX.XX (Target 2 azimuth)
b. R2 = XX.XXX (Target 2 elevation)
c. R3 = 00002.

6.2.18.4.8 Verify the data appearing in R1 and R2 and if correct, perform the following sequence:

a. VERB 24, ENTER
b. +XXX.XX, ENTER (Target 2 azimuth)
c. ±XX.XXX, ENTER (Target 2 elevation)

6.2.18.4.9 After the correct readings for R1 and R2 are verified, enter VERB 33, ENTER into the DSKY.

6.2.18.4.10 Set the OPTICS ZERO switch to OFF. Enter VERB 33 ENTER into the DSKY.

6.2.18.4.11 When the DSKY displays V51 flashing and R1 = 00001 set the OPTICS MODE switch on the G&N Indicator Control Panel to CMC. The CMC will align the SXT star LOS to the Target 1 position. When the alignment is complete as observed by no further movement of the Telescope Panel Angle Counters (TPAC) set the OPTICS MODE switch to MANUAL.

6.2.18.4.12 Using the OPTICS Hand Controller and a convenient CONTROLLER SPEED, align the SXT StLOS with Target 1 and press the MARK pushbutton. In approximately 30 seconds VERB 50 NOUN 25 shall flash with R1 = 00016. If satisfied that the MARK was good press the PRO pushbutton. If not satisfied with MARK, press the MARK REJECT pushbutton and repeat this step.

6.2.18.4.13 When the DSKY displays VERB 51 flashing and R1 = 00002 set the OPTICS MODE switch to CMC. The CMC will align the SXT to the Target 2 position. When alignment is complete as observed by no further movement of the TPAC, set the OPTICS MODE switch to MANUAL.

6.2.18.4.14 Using the OPTICS Hand Controller and a convenient CONTROLLER SPEED, align the SXT StLOS with Target 2 and press the MARK pushbutton. In approximately 30 seconds VERB 50 NOUN 25 shall flash and R1 = 00016. If satisfied that the MARK was good press the PRO pushbutton. If not satisfied with the MARK press the MARK REJECT pushbutton and repeat this step.

6.2.18.4.15 On the DSKY, observe the following data displayed:

VERB 06 NOUN 93
R1 = ±XX.XXX (X gyro elevation error, deg)
R2 = ±XX.XXX (Y gyro elevation error, deg)
R3 = ±XX.XXX (Z gyro azimuth error, deg)

Record R1, R2 and R3. The X and Y gyro elevation error shall be 0.00±0.55 degrees and the Z gyro azimuth error shall be 0.00±0.3 degrees. Enter VERB 34 ENTR into the DSKY. Observe PROG display on DSKY change to 02.

6.2.18.4.16 Immediately repeat steps 6.2.18.4.2 through 6.2.18.4.15 twice.

6.2.18.4.17 Repeat steps 6.2.18.4.1 through 6.2.18.4.15 at 150, 180 and 210 minutes from T_0.

6.2.18.4.18 Enter VERB 36 ENTR into the DSKY.

6.2.18.4.19 Enter the following into the DSKY:

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

Set the G&N POWER OPTICS switch on the LEB Lighting Control Panel to OFF.

6.2.18.5 Gyro Compassing Stability

6.2.18.5.1 Calculate the average of the first three X and Y gyro elevation errors and the first three Z gyro azimuth errors.

6.2.18.5.2 The last three X and Y gyro elevation errors shall not deviate from the baseline X and Y gyro elevation errors determined above by more than ±0.15 degrees.

6.2.18.5.3 The last three Z gyro azimuth errors shall not deviate from the baseline Z gyro azimuth error determined above by more than ±0.06 degrees.

6.2.19 CMC Voltage Margin Test

6.2.19.1 Verify that the G&N IMU HTR MNA and MNB circuit breaders are engaged. Computer MNA and MNB breakers are engaged, IMU MNA and MNB circuit breakers are not engaged, and the G&N Power-IMU switch on the LEB Lighting Control Panel is in the OFF position.

6.2.19.2 On the PSA Adapter Module (PSAAM), set the INHIBIT VOLTAGE FAIL switch to ON.

6.2.19.3 Rotate the LEB LTS NUMERICS SEL to approximately center position. Decrease the lighting to an absolute discernible minimum.

NOTE: This condition should not be altered throughout the test.

6.2.19.4 On K-148 enter the following:

VERB 36 ENTR

6.2.19.5 Into R-154 insert 0001. Verify and execute.

6.2.19.5.1 Into R-153 insert 1100. Verify and execute.

CAUTION: During the performance of this test, the +4 VDC CMC Power Supply shall not be operated at less than +2.5 vdc or greater than +5.2 vdc (CG 1030). The +14 VDC CMC Power Supply shall not be operated at less than +8.5 vdc or greater than +17.0 vdc (CG 1020).

NOTE: The flashing indication of the CMC Power Supplies on the CRT may be disregarded for this test.

6.2.19.6 Fail Voltage Detector Test

6.2.19.7 On K-148 enter the following sequence:

VERB 21 NOUN 27 ENTR
00010 ENTR

6.2.19.8 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to OFF.

6.2.19.9 Into C-156 insert +000001244. Execute and verify.

6.2.19.9.1 Into R-154 insert 0101. Execute and verify.

6.2.19.9.2 Into C-156 insert +XX.X001244. (The value XX.X shall be slowly increased until a CMC Voltage Fail occurs.) Execute and verify.

6.2.19.10 On the DSKY, verify the RESTART lamp is lit.

6.2.19.10.1 On the G&N panel verify the CMC Warning light is on and the MASTER ALARM light is on.

6.2.19.10.2 Press the MASTER ALARM pushbutton to reset.

6.2.19.11 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to the ON position.

6.2.19.12 On the CRT, verify the +14 VDC CMC supply (CG 1020) is between 15.6 and 16.4 vdc. Record.

6.2.19.12.1 Record the final C-START setting.

6.2.19.13 Into R-154 insert 0001. Execute and verify.

6.2.19.14 On K-148 enter the following:

VERB 36 ENTR
press RSET (Reset)

6.2.19.15 On K-148 enter the following:

VERB 21 NOUN 27 ENTR
00010 ENTR

6.2.19.16 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to OFF.

6.2.19.17 Into C-156 insert -000001244. Execute and verify.

6.2.19.17.1 Into R-154 insert 0101. Execute and verify.

6.2.19.17.2 Into C-156 insert -XX.X001244. (The value XX.X shall be increased, negatively, until a CMC Voltage Fail occurs.) Execute and verify.

6.2.19.18 On the DSKY, verify the RESTART lamp is lit.

6.2.19.18.1 On the G&N panel verify the CMC Warning light is on and the MASTER ALARM light is on.

6.2.19.18.2 Press the MASTER ALARM pushbutton to reset.

6.2.19.19 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to ON.

6.2.19.20 On the CRT, verify the +14 VDC CMC supply (CG 1020) is between 12.1 and 12.8 vdc. Record.

6.2.19.20.1 Record the final C-START setting.

6.2.19.21 Into R-154 insert 0001. Execute and verify.

6.2.19.22 On K-148 enter the following:

VERB 36	ENTR
press	RSET (Reset)

6.2.19.23 Into C-156 insert +000001244. Execute and verify.

6.2.19.24 On K-148 enter the following:

VERB 21	NOUN 27	ENTR
00010		ENTR

6.2.19.25 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to OFF.

6.2.19.26 Into C-156 insert +000001234. Execute and verify.

6.2.19.26.1 Into R-154 insert 0011. Execute and verify.

6.2.19.26.2 Into C-156 insert +XX.X001234. (The value XX.X shall be slowly increased until a CMC Voltage Fail occurs.) Execute and verify.

6.2.19.27 On the DSKY, verify the RESTART lamp is lit.

6.2.19.27.1 On the G&N panel verify the CMC Warning light is lit and the MASTER ALARM light is on.

6.2.19.27.2 Press the MASTER ALARM pushbutton to reset.

6.2.19.28 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to the ON position.

6.2.19.29 On the CRT verify the +4 VDC CMC Supply (CG 1030) is between 4.2 and 4.7 vdc. Record.

6.2.19.30 Record the final C-START setting.

6.2.19.31 Into R-154 insert 0001. Execute and verify.

6.2.19.32 On K-148 enter the following:

VERB 36	ENTR
press	RSET (Reset)

6.2.19.33 On K-148 enter the following:

VERB 21 NOUN 27 ENTR
00010 ENTR

6.2.19.34 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to OFF.

6.2.19.35 Into C-156 insert -000001234. Execute and verify.

6.2.19.35.1 Into R-154 insert 0011. Execute and verify.

6.2.19.35.2 Into C-156 insert -XX.X001234. (The value XX.X shall be increased, negatively, until a CMC Voltage Fail occurs.) Execute and verify.

6.2.19.36 On the DSKY, verify the RESTART lamp is lit.

6.2.19.36.1 On the G&N panel verify the CMC Warning light is on and the MASTER ALARM light is on.

6.2.19.36.2 Press the MASTER ALARM pushbutton to reset.

6.2.19.37 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to ON.

6.2.19.38 On the CRT verify the +4 VDC CMC supply (CG 1030) is between 3.8 and 3.4 vdc. Record.

6.2.19.39 Record the final C-START setting.

6.2.19.40 Into R-154 insert 0001. Execute and verify.

6.2.19.41 On K-148 enter the following:

VERB 36 ENTR
press RSET (Reset)

6.2.19.42 Into C-156 insert +000001234. Execute and verify.

6.2.19.43 Voltage Margin Test

6.2.19.44 Verify the appropriate K-START tape for CSM Self-Check Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.19.44.1 Start the tape reader.

6.2.19.45 When the tape reader stops, verify:

R1 = +YYYYY (The value of YYYYY is Flight Rope dependent and is found in Appendix II.)
R2 = +10538 (Tape Number)
R3 = -000XX (Tape revision number)

6.2.19.45.1 Start the tape reader.

6.2.19.46 When the tape reader stops, verify:

R1 = 00101

6.2.19.47 Initiate Self-Check.

6.2.19.47.1 Start the tape reader.

6.2.19.48 When the tape reader stops, record the time. Wait until R2 increments twice.

6.2.19.49 Into R-154 insert 0111. Execute and verify.

6.2.19.50 Into C-156 insert +000001244. Execute and verify.

6.2.19.50.1 Repeatedly insert into C-156 +XX.X001244. (The value XX.X shall be slowly increased until the +14 VDC CMC supply has a value of +16.4 (+0.1, -0.0) vdc.) Execute and verify.

6.2.19.51 Into C-156 insert +000001234. Execute and verify.

6.2.19.51.1 Repeatedly insert into C-156, +XX.X001234. (The value XX.X shall be slowly increased until the +4 VDC CMC supply has a value of +4.5 (+0.1, -0.0) vdc.) Execute and verify.

6.2.19.52 Wait until the R2 display increments twice.

6.2.19.53 Into C-156 insert -000001244. Execute and verify.

6.2.19.53.1 Repeatedly insert into C-156, -XX.X001244. (The value XX.X shall be slowly increased, negatively, until the +14 VDC CMC supply has a value of 12.1 (+0.1, -0.0) vdc.) Execute and verify.

6.2.19.54 Wait until the R2 display increments twice.

6.2.19.55 Into C-156 insert -000001234. Execute and verify.

6.2.19.55.1 Repeatedly insert into C-156, -XX.X001234. (The value XX.X shall be slowly increased, negatively, until +4 VDC CMC supply has a value of 3.4 (+0.1, -0.0) vdc.) Execute and verify.

6.2.19.56 Wait until the R2 display increments twice.

6.2.19.57 Into C-156 insert +000001244. Execute and verify.

6.2.19.57.1 Repeatedly insert into C-156, +XX.X001244. (The value XX.X shall be slowly increased until the +14 VDC CMC supply has a value of +16.4 (+0.1, -0.0) vdc.) Execute and verify.

6.2.19.58 Wait until the R2 display increments twice.

6.2.19.59 Into C-156, insert +000001244. Execute and verify.

6.2.19.60 Into C-156, insert +000001234. Execute and verify.

6.2.19.61 On K-148 enter the following:

VERB 36 ENTR

6.2.19.62 Into R-154, insert 0000. Execute and verify.

6.2.19.63 Into R-153, insert 0000. Execute and verify.

6.2.19.64 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to OFF

APPENDIX I

Signal	Link	Nomenclature	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
CG 1020	1	+14 VDC CMC SUPPLY	+14.0±0.4 VDC	0%
CG 1021	1	+14V CMC SUPPLY NOISE RMS	0.2 VRMS MAX	0%
CG 1030	1	+4 VDC CMC SUPPLY	+4.00±0.2 VDC	0%
CG 1031	1	+4V CMC SUPPLY NOISE RMS	0.2 VRMS MAX	0%
CG 1040	2	+120 VDC PIPA SUPPLY	+120±6.0 VDC	1%
CG 1042	1	+120 VDC PIPA SUP NOISE RMS	1.5 VRMS MAX	0%
CG 1051	1	+20 VDC PIPA SUPPLY	+20.0±1.2 VDC	0%
CG 1052	1	-20 VDC PIPA SUPPLY	-20±2 VDC	0%
CG 1053	1	+20 VDC PIPA SUP NOISE RMS	1.0 VRMS MAX	0%
CG 1070	1	+4 VDC CDU SUPPLY	+4.0±0.2 VDC	0%
CG 1071	1	+4 VDC CDU SUP NOISE RMS	0.1 VRMS MAX	0%
CG 1100	1	-28 VDC SUPPLY	-27.5±6.0 VDC	0%
CG 1110	2	2.5 VDC TM BIAS	+2.50±0.06 VDC	0%
CG 1201	2	IMU 28V .8KC 1% 0° RMS	28.00±0.56VRMS	1%
CG 1202	1	IMU 28V .8KC 5% - 90° RMS	28.0±1.4 VRMS	0.33%
CG 1203	1	IMU 28V .8KC 5% 0° RMS	28.0±2.1 VRMS	0.33%
CG 1207	1	PH DIFF IMU 5% 0°, -90°	-90±10°	2.3%
CG 1211	1	OPTX 28V .8KC 1% 0° RMS	28.00±0.56 VRMS	0.33%
CG 1212	1	OPTX 28V .8KC 5% - 90° RMS	28.00±1.48 VRMS	0.33%
CG 1220	1	PH DIFF OPTX 1% IMU 1%	0° ±10°	2.3%
CG 1331	2	3.2 KC 28V SUPPLY	28.6±0.56 VRMS	1%
CG 1336	1	PH DIFF 3.2 KC 28V/CMC SYNC	0° ±10°	2.3%
CG 1500	1	+28 VDC IMU OPERATE BUS	28.8±3 VDC	0%
CG 1501	1	+28V IMU OPERATE BUS NOISE RMS	1.0 VRMS MAX	0%
CG 1510	1	+28 VDC IMU STANDBY BUS	28.8±3 VDC	0%
CG 1511	1	+28V IMU STANDBY BUS NOISE RMS	1.0 VRMS MAX	0%
CG 1520	1	+28 VDC CMC OPERATE BUS	28.8±3 VDC	0%
CG 1521	1	+28V CMC OPERATE BUS NOISE RMS	2.0 VRMS MAX	0%
CG 1530	1	+28 VDC OPTX OPERATE BUS	28.8±3 VDC	0%
CG 1531	1	+28V OPTX OPERATE BUS NOISE RMS	2.0 VRMS MAX	0%
CG 2001	2	X PIPA SG O/P	5 VRMS max	3%
CG 2021	2	Y PIPA SG O/P	5 VRMS max	0.3%
CG 2041	2	Z PIPA SG O/P	5 VRMS max	3%
CG 2108	1	IG SERVO ERROR QUAD	0.0±1.2 VRMS	3.6%
CG 2112	2	IG 1X RESOLVER O/P SIN	18.38±1.84 VRMS @ 45°	2.5%
CG 2113	2	IG 1X RESOLVER O/P COS	18.38±1.84 VRMS @ 45°	2.5%
CG 2117	2	IG SERVO ERROR IN PHASE	0.0±60 mv RMS @ null	1.4%
CG 2120	1	IG TORQUE MOTOR CURRENT	0.125 amp max during Fine Alignment Torquing	0%

PSAAM OUTPUT is the source of Link 1 signals. SCA OUTPUT is the source of Link 2 signals.

APPENDIX I (Continued)

Signal	Link	Nomenclature	G&N Test Requirements	PSAAM and/or SCA Uncertainty % of Full Scale
CG 2138	1	MG SERVO ERROR QUAD	0.0±1.2 VRMS	3.6%
CG 2142	2	MG 1X RESOLVER O/P SIN	18.38±1.84 VRMS @ 45°	2.5%
CG 2143	2	MG 1X RESOLVER O/P COS	18.38±1.84 VRMS @ 45°	2.5%
CG 2147	2	MG SERVO ERROR IN PHASE	0.0±60 mv rms @ null	1.4%
CG 2150	1	MG TORQUE MOTOR CURRENT	0.125 amp max during Fine Align Torquing	0%
CG 2168	1	OG SERVO ERROR QUAD	0.0±1.2 VRMS	3.6%
CG 2172	2	OG 1X RESOLVER O/P SIN	18.38±1.84 VRMS @ 45°	2.5%
CG 2173	2	OG 1X RESOLVER O/P COS	18.38±1.84 VRMS @ 45°	2.5%
CG 2177	2	OG SERVO ERROR IN PHASE	0.0±60 mv RMS @ null	1.4%
CG 2180	1	OG TORQUE MOTOR CURRENT	0.125 amp max during Fine Align Torquing	0%
CG 2219	1	PITCH ATT ERROR-CDU DAC O/P	5.06±0.5 VRMS @ 17°	0.67%
CG 2220	1	IG CDU FINE ERROR	0.0±0.07 VRMS @ null	0.29%
CG 2221	1	IG CDU COARSE ERROR	0.0±0.68 VRMS at null	0.29%
CG 2249	1	YAW ATT ERROR-CDU DAC O/P	5.06±0.5 VRMS at 17°	0.67%
CG 2250	1	MG CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 2251	1	MG CDU COARSE ERROR	0.0±0.68 VRMS at null	0.29%
CG 2279	1	ROLL ATT ERROR-CDU DAC O/P	5.06±0.5 VRMS at 17°	0.67%
CG 2280	1	OG CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 2281	1	OG CDU COARSE ERROR	0.0±0.68 VRMS	0.29%
CG 2300	2	PIPA TEMPERATURE	130.5±1.5° F Operate Mode	2%
CG 3011	1	TRUNNION CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 3021	1	SHAFT CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 3117	1	SXT SHAFT SERVO ERROR IN PH	-0.25 to -2.00 VRMS at Hi Rate	1.1%
CG 3118	1	SXT TRUNNION SERVO ERROR IN PH	-0.25 to -2.00 VRMS at Hi Rate	1.1%
CG 3140	1	SXT SHAFT TACH O/P	3.3±1.3 VRMS at Hi Rate	1.1%
CG 3145	1	SXT SHAFT MTR CONTROL WINDING	+0.5 to 4.00 VRMS at Med Rate	1.1%
CG 3150	1	SXT TRUNNION TACH O/P	3.3±1.3 VRMS at Hi Rate	1.1%
CG 3155	1	SXT TRUNNION MTR CONTROL WINDING	+0.25 to +2.00 VRMS at Med Rate	1.1%

APPENDIX I (Continued)

Signal	Link	Nomenclature	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
CG 3160	1	SCT SHAFT TACK O/P	3.3± 1.3 VRMS at Hi Rate	1.1%
CG 3170	1	SCT TRUNNION TACH O/P	0.85± 0.35 VRMS at Hi Rate	1.1%
CG 3721	2	SHAFT CDU DAC O/P	10.12± 1.00 VRMS at 17°	1%
CG 3722	2	TRUNNION CDU DAC O/P	10.12± 1.00 VRMS at 17°	1%
CG 4300	1	CMC TEMP	87.5±42.5°F	0.23%
CG 6020	1	PIPA CAL MODULE TEMP	72.5±27.5°F	0.23%
CG 6021	1	IMU 800 cps 5% TEMP (PSA)	90 30°F	0%

See Page 5

APPENDIX II

K-START TAPE INFORMATION

NAME	NUMBER*	PROGRAM	R1=YYYYY R1 DISPLAY
CM Self-Check Test	F09C104-K10538-XX	COLOSSUS REV 249	09249
CM G/N OPCHK	F09C104-K10531-XX	↓	09249
CM Semi-Automatic Mode Test	F09C104-K10530-XX	↓	09249
IRIG Scale Factor Test	F09C104-K00083-XX	↓	09249
IMU Performance Test	F09C104-K00081-XX	↓	09249
Alarms and Interrupts Test	F09C107-K10545-XX	↓	09249
CM Self-Check Test	F11C106-K10538-XX	COLOSSUS II	11045
CM Self-Check Test	F11C107-K10538-XX	COLOSSUS IIA	11055
CM G/N OPCHK	F11C107-K10531-XX	(COMANCHE REV 55)	11055
CM Semi-Automatic Mode Test	F11C107-K10530-XX	↓	11055
IRIG Scale Factor Test	F11C107-K00083-XX	↓	11055
IMU Performance Test	F11C107-K00081-XX	↓	11055
Alarms and Interrupts Test	F11C107-K10545-XX	↓	11055

*NOTE: Where XX equals the tape revision number.

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POST INSTALLATION CHECKOUT PROCESS SPECIFICATION FOR THE APOLLO GUIDANCE & NAVIGATION SYSTEM BLOCK II-KSC WITH COLOSSUS FLIGHT ROPES

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				AC	NASA
9/5/68	A	36792	2, 10, 12, 22, 32, 40, 41, 43, 44, 53,	EA	WLS
			78, 93, 108, 109, 111, 122, 124-		
			126, 129		
12/4/68	B	37077	2, 15, 23, 26, 27, 28, 32, 34, 42, 43,	EA	WLS
			52, 55, 56, 57, 59, 117, 121, 122, 123		
2/3/69	C	37296	2, 8, 21, 22, 33, 44, 53, 78, 93, 124,	EA	WLS
			128		
4/2/69	D	37473	2, 22, 26, 27, 35, 41, 44, 53, 78, 93,	EA	RJJ
			124, 130		
6/11/69	E	37650	2, 25-130, was 130 pages; now 133	EA	--
7/9/69	F	37681	45	EA	--

This specification consists of page 1 to 133 inclusive.

APPROVALS	NOT REQUIRED CCA 497-0274 NASA/MSC	MIT/IL	CCB 7/25/6	AC

6.2.6 G&N Operational Test

6.2.6.1 Verify the appropriate K-START tape for CM G&N OPCHK is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.6.1.1 Start tape reader.

6.2.6.1.2 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
b. R2 = +10531 (tape number)
c. R3 = -000XX (tape revision number)

6.2.6.2 E-Memory Program Load and Sum Check.

6.2.6.2.1 Start tape reader.

6.2.6.2.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00101.

6.2.6.3 Local g Measurement.

6.2.6.3.1 Start tape reader.

6.2.6.3.2 In approximately 10 minutes, VERB 06 NOUN 98 shall flash.

6.2.6.3.3 From the CRT DSKY display read and record Row 1 and Row 2 (local gravity whole and fractional, respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.2.6.4 Horizontal Earth Rate Measurement.

6.2.6.4.1 Press PRO pushbutton on DSKY.

6.2.6.4.2 In approximately 2 seconds VERB 06 NOUN 98 shall flash. From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.2.6.5 Enter the following on K-148:

VERB 34 ENTR
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.2.6.6 IMU HEATER CURRENT Duty Cycle determination.

NOTE: This test is to be performed once in the VAB and at the PAD during the FRT, CDDT and CDT.

6.2.6.6.1 Record PIPA TEMP (CG 2300) reading on the CRT, CAL MOD TEMP (CG 6020) reading on the CRT and the EVAPORATOR OUTLET temperature reading.

6.2.6.6.2 Calculate the Duty Cycle for the IMU HEATER CURRENT (CG 2302) by dividing the time ON for 10 cycles by the total (ON and OFF) time for 10 cycles as indicated on the event recorder.

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POST INSTALLATION CHECKOUT PROCESS SPECIFICATION FOR THE APOLLO GUIDANCE & NAVIGATION SYSTEM BLOCK II-KSC WITH COLOSSUS FLIGHT ROPES

Record of Revisions

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				AC	NASA
1/20/70	G	38001	2, 21, 22, 26-28, 42, 45, 54, 60-133	EA	MDH
			Was 133 pages, now 142 pages.		

This specification consists of page 1 to 142inclusive.

APPROVALS	Not Required CCA497-0274 **NASA/MSC**		CCB E. N. Austin 7/25/68 **MIT/IL**	AEA D. A. Ziemer **ACSP**

6.2.1.3.4 The +28 VDC CMC OPERATE voltage (CG 1520) shall be +28.8±3 VDC. Verify CRT indication. On DSKY verify TEMP light is ON. On the G&N Indicator Control Panel verify PGNS light is ON.

6.2.1.3.5 The voltage output of the +4 VDC CMC supply shall be +4.00±0.20 VDC. (CG 1030). The value on the CRT shall be recorded.

6.2.1.3.6 The voltage output of the +14 VDC CMC supply shall be +14.0±0.4 VDC, (CG 1020). The value on the CRT shall be recorded.

6.2.1.3.7 Using DSKY, enter VERB 36, ENTR, then press RESET. Verify that R1, R2, R3, VERB, NOUN, and PROG are blank.

6.2.1.3.8 IMU HTR Heater Power On

6.2.1.3.8.1 Enter the IMU Standby Mode of operation by engaging the IMU HTR MN A and MN B breakers on the Right Hand Circuit Breaker Panel (breakers pushed in).

NOTE: RESTART Lamp may illuminate; if it does, press [illegible] RSET on the DSKY.

6.2.1.3.8.2 Verify that the IMU +28 VDC STANDBY discrete lamp on Event Module is illuminated (CG 1513). On DSKY verify TEMP light is extinguished. On the G&N Indicator Control Panel verify PGNS light is extinguished.

6.2.1.3.8.3 Record the value of the following signals displayed on the CRT.

	Signal	Requirement
a.	CG 1331 28V 3200 CPS POWER SUPPLY FEEDBACK	28.6±0.6 VRMS
b.	CG 1510 +28 VDC STANDBY POWER	28.8±3 VDC

6.2.1.3.8.4 The PIPA TEMP on the CRT shall be monitored at 15 min., 1 hr. and 2 hrs. from execution of 6.2.1.3.8.1 to insure that the PIPA Temperature Control Loop circuitry is operating to maintain a temperature of 130.5±1.5°F (CG2300).

6.2.1.3.8.5 At the end of the 2-hour period, record the PIPA temperature (CG2300) on the CRT. On the event recorder verify that the IMU HEATER current discrete (CG2302) is ON and that the IMU BLOWER current discrete (CG2303) is OFF over the last two hour period (occasionally discretes may cycle).

6.2.1.3.8.6 With the eyepiece in the Eyepiece Storage Unit, check the eyepiece surface temperature at the quick disconnect flange using an L&N #8693 Temperature Potentiometer, or a similar type thermocouple probe meter. Record both the ESU ambient and eyepiece surface temperatures. Verify that the eyepiece surface temperature is between 2 and 30 degrees F. above the ambient temperature.

6.2.2 CMC Operational Test

NOTE: Verify that IMU STANDBY power (including CMC operate power) is applied, IMU OPERATE Power is not applied. (G&N IMU HTR MN A and MN B breakers engaged, Computer MN A and MN B breakers engaged, IMU MN A and MN B breakers disengaged, G/N Power-IMU switch on LEB Lighting Control Panel in OFF Position).

6.2.2.1 CMC Self-Check.

6.2.2.1.1 On K-148, enter the following:

VERB 36 ENTR Wait 10 seconds.

6.2.2.1.2 Verify the appropriate K-START tape for CM Self-Check Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.2.1.3 Start tape reader.

6.2.2.1.4 When tape reader stops, verify the following on the CRT DSKY display:

R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
R2 = +10538 (tape number)
R3 = -YYYZX (X is the tape revision number, YYY is the spacecraft number when assigned and Z is the revision to the rope revision number and has meaning for tapes in Section B of Appendix II).

6.2.2.1.5 Load E-Memory Program.

6.2.2.1.5.1 Start tape reader.

6.2.2.1.5.2 When tape reader stops, verify R1 displays +00101.

6.2.2.1.6 Initiate Self-Check

6.2.2.1.6.1 Start tape reader.

6.2.2.1.6.2 When R3 = 00002, start tape reader.

6.2.2.1.6.3 When tape reader stops, wait 30 seconds.

6.2.2.2 DSKY Check.

6.2.2.2.1 Start tape reader.

6.2.2.2.2 All the electroluminescent elements (PROG, VERB, NOUN, and Row 1, Row 2, Row 3) shall display the decimal number nine (9). Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's

6.2.2.6 Alarms and Interrupts Test

6.2.2.6.1 Verify the appropriate K-START tape for Alarms and Interrupts Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.2.6.2 Start the tape reader.

6.2.2.6.3 When the Tape Reader stops, press KEY RELEASE and verify:

R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II.)
R2 = +10545 (Tape Number)
R3 = -YYYZX (X is the tape revision number, YYY is the spacecraft number when assigned, and Z is the revision to the rope revision number and has meaning for tapes in Section B of Appendix II).

6.2.2.6.4 Start the tape reader.

6.2.2.6.5 When the tape reader stops, verify:

R1 = 00100

6.2.2.7 Parity Fail Test and Rupt Lock Test

6.2.2.7.1 Parity Fail Test

6.2.2.7.1.1 Start the tape reader.

6.2.2.7.1.2 When the tape reader stops, verify the following:

a. On the DSKY, the RESTART lamp is lit.
b. The PGNS Caution lamp is lit.

6.2.2.7.1.3 On the DSKY press the RSET pushbutton. Verify the RESTART and PGNS Caution lamps are not lit.

6.2.2.7.1.4 Start the tape reader.

6.2.2.7.1.4.1 When the Tape Reader Stops, press KEY RELEASE and verify:

R1 = 00101

6.2.2.7.1.4.2 Start the Tape Reader.

6.2.2.7.1.5 When the tape reader stops, verify:

R1=00200

6.2.2.7.2 Rupt Lock Test

6.2.2.7.2.1 Start the tape reader.

6.2.2.7.2.2 When the tape reader stops, verify the following:

a. The RESTART lamp on the DSKY is lit.
b. The PGNCS Caution lamp is lit.

6.2.2.7.2.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNS Caution lamps are not lit.

6.2.2.7.2.4 Start the tape reader.

6.2.2.7.2.5 When the Tape Reader stops, press KEY RELEASE and verify:

R1 = 00201

6.2.2.7.2.6 Start the tape reader.

6.2.2.7.2.7 When the tape reader stops, verify:

R1 = 00300

6.2.2.8 TC Trap Test

6.2.2.8.1 Start the tape reader.

6.2.2.8.2 When the tape reader stops, verify the following:

a. The RESTART lamp on the DSKY is lit.
b. The PGNS Caution lamp is lit.

6.2.2.8.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNS Caution lamps are not lit.

6.2.2.8.4 Start the tape reader.

6.2.2.8.5 When the Tape Reader stops, press KEY RELEASE and verify:

R1 = 00301

6.2.2.8.6 Start the tape reader.

6.2.2.8.7 When the tape reader stops, verify the following:

a. The RESTART lamp on the DSKY is lit.
b. The PGNS Caution lamp is lit.

6.2.2.8.8 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNS Caution lamps are not lit.

6.2.2.8.9 Start the tape reader.

6.2.2.8.10 When the Tape Reader stops, press KEY RELEASE and verify:

R1 = 00302

6.2.2.8.11 Start the tape reader.

6.2.2.8.12 When the tape reader stops, verify:

R1 = 00400

6.2.2.9 Night Watchman Test

6.2.2.9.1 Start the tape reader.

6.2.2.9.2 When the tape reader stops, verify the following:

a. The RESTART lamp on the DSKY is lit.
b. The PGNS Caution lamp as lit.

6.2.2.9.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNS Caution lamps are not lit.

6.2.2.9.4 Start the tape reader.

6.2.2.9.5 When the Tape Reader stops, press KEY RELEASE and verify:

R1 = 00401

6.2.5.2.2 Insure that interfacing system EPS and ECS are turned on and operating properly.

CAUTION: The remaining procedure must be followed in sequence specified. Failure to adhere to this sequence may require recalibration of the inertial components.

6.2.5.2.3 Energize the G&N COMPUTER MN A and MN B breakers on the Right Hand Circuit Breaker panel (breakers pushed in). Press the STBY pushbutton on the DSKY for approximately 3 seconds. Verify +14 and +4 VDC AGC power supply outputs on CRT display. Voltages shall be +14±0.4V (CG 1020) and +4±0.2 (CG1030). On DSKY verify TEMP light is ON.

6.2.5.2.4 Set the G&N POWER AC1 and AC2 breakers on the Right Hand Circuit Breaker Panel to ON (breakers pushed in). Set the G&N POWER AC1-OFF-AC2 switch to AC1.

6.2.5.2.4.1 Set the G&N DSKY and Display Panel brightness to the minimum acceptable level by manipulation of LIGHTS - NUMERICS control on both Left Hand Circuit breaker panel and LEB Lighting Control panel.

6.2.5.2.5 Energize the G&N IMU HTR, MN A and MN B breakers on the Right Hand Circuit Breaker panel (breakers pushed in). Insure that the CMC +28 VDC discrete lamp on the Event Module is illuminated (CG 1523). Verify TEMP light on DSKY is extinguished.

6.2.5.2.5.1 Set/Verify the following switches on the PSAAM.

a. PSAAM PWR to ON
b. INHIBIT VOLTAGE FAIL to OFF.

6.2.5.2.6 Enter VERB 36 ENTER into K148. Press ERROR RESET pushbutton on K148. All computer alarms on the Main Display Console (MDC) and LEB AGC DSKY shall clear. Verify that DSKY R1, R2, R3, VERB, NOUN and PROG indications are blank.

6.2.5.2.7 Verify the appropriate K-START tape for CM Self-Check Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.5.2.8 Start tape reader.

6.2.5.2.9 When tape reader stops, verify the following on the CRT DSKY display:

R1 = +YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
R2 = +10538 (Tape number)
R3 = -YYYZX (X is the tape revision number, YYY is the spacecraft number when assigned, and Z is the revision to the rope revision number and has meaning for tapes in Section B of Appendix II).

6.2.5.2.10 Start tape reader.

6.2.6 G&N Operational Test

6.2.6.1 Verify the appropriate K-START tape for CM G&N OPCHK is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.6.1.1 Start tape reader.

6.2.6.1.2 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
b. R2 = +10531 (tape number)
c. R3 = -YYYZX (X is the tape revision number, YYY is the spacecraft number when assigned, and Z is the revision to the rope revision number and has meaning for tapes in Section B of Appendix II).

6.2.6.2 E-Memory Program Load and Sum Check.

6.2.6.2.1 Start tape reader.

6.2.6.2.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00101.

6.2.6.3 Local g Measurement.

6.2.6.3.1 Start tape reader.

6.2.6.3.2 In approximately 10 minutes, VERB 06 NOUN 98 shall flash.

6.2.6.3.3 From the CRT DSKY display read and record Row 1 and Row 2 (local gravity whole and fractional, respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.2.6.4 Horizontal Earth Rate Measurement.

6.2.6.4.1 Press PRO pushbutton on DSKY.

6.2.6.4.2 In approximately 2 seconds VERB 06 NOUN 98 shall flash. From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.2.6.5 Enter the following on K-148:

VERB 34	ENTR
VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR

6.2.6.6 IMU HEATER CURRENT Duty Cycle determination.

NOTE: This test is to be performed once in the VAB and at the PAD during the FRT, CDDT and CDT.

6.2.6.6.1 Record PIPA TEMP (CG 2300) reading on the CRT, CAL MOD TEMP (CG 6020) reading on the CRT and the EVAPORATOR OUTLET temperature reading.

6.2.6.6.2 Calculate the Duty Cycle for the IMU HEATER CURRENT (CG 2302) by dividing the time ON for 10 cycles by the total (ON and OFF) time for 10 cycles as indicated on the event recorder.

6.2.9 Semi-Automatic Mode Test

6.2.9.1 Verify the appropriate K-START tape for CM Semi-Automatic Mode Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.9.1.1 Start tape reader.

6.2.9.1.2 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
b. R2 = +10530 (tape number)
c. R3 = -YYYZX (X is the tape revision number. YYY is the spacecraft number when assigned, and Z is the revision to the rope revision number and has meaning for tapes in Section B of Appendix II).

6.2.9.2 E-Memory Program Load

6.2.9.2.1 Start tape reader.

6.2.9.2.2 When tape reader stops verify the following on CRT DSKY:

R1 = 00101

6.2.9.3 Command Accuracy 0°.

6.2.9.3.1 Start tape reader

6.2.9.3.2 When tape stops verify that CRT DSKY R1 indicates 00201. Wait 15 seconds.

6.2.9.3.3 Read and record CRT IMU Gimbal angles. The indications shall be 000±003 degrees.

6.2.9.3.4 Read and record CRT CDU angle indications. The indications shall be +000.00±001.50.

6.2.9.4 Command Accuracy 45°.

6.2.9.4.1 Start tape reader.

6.2.9.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00301. Wait 5 seconds.

6.2.9.4.3 Read and record CRT IMU Gimbal angles. The indications shall be 045±003 degrees.

6.2.9.4.4 Read and record CRT CDU angle indications. Indications shall be +045.00±001.50.

6.2.9.5 CDU Repeating Accuracy 45°.

6.2.9.21.5 Start tape reader.

6.2.9.21.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.22 Optics CDU Command Rate Test.

6.2.9.22.1 Set the G/N POWER - OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify OPTX BUS, 28V 800 ∿ 1% and 5% Power Supplies.

6.2.9.22.2 Set the OPTICS COUPLING switch on the G&N Panel to DIRECT. Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +5 degrees of zero as indicated by the TPAC (Telescope Trunnion Slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 20 seconds. Set the OPTICS ZERO switch to OFF. Set the OPTICS MODE switch to CMC.

6.2.9.22.3 Shaft Slew Rate Test.

6.2.9.22.3.1 Start tape reader.

6.2.9.22.3.2 In approximately 25 seconds VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 00018.88000 and 00011.32000.

6.2.9.22.4 Trunnion Slew Rate Test

6.2.9.22.4.1 Start tape reader.

6.2.9.22.4.2 In approximately 15 seconds VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 00004.71000 and 00002.83000.

6.2.9.23 Test Termination

6.2.9.23.1 Start tape reader.

6.2.9.23.2 On the GNIC Panel, set the OPTICS MODE switch to MAN. Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within 5 degrees of zero, as indicated by the TPAC (Telescope Trunnion Slaved to SXT).

6.2.9.23.3 Set the OPTICS ZERO switch to ZERO. Wait 20 seconds. Set the OPTICS MODE switch to CMC.

6.2.9.24 Computer Manual Mode Optics Drive

NOTE: Perform the following procedure only if GNIC panel, P/N 2021290-51 is installed in the spacecraft.

6.2.9.24.1 Place the OPTICS ZERO switch on the Indicator Control Panel to ZERO and the OPTICS MODE switch to CMC.

6.2.9.24.1.1 Wait 20 seconds and then place the OPTICS ZERO switch on the Indicator Control Panel to OFF.

6.2.9.24.1.2 Perform the following on the DSKY:

VERB 41 NOUN 91 ENTR
+00000 ENTR
+00000 ENTR

6.2.9.24.2 Place the OPTICS MODE switch on the Indicator Control Panel to MANUAL. Perform the following step within 1 minute.

6.2.9.24.2.1 Perform the following on the DSKY:

VERB 21 NOUN 10 ENTR
00012 ENTR
00002 ENTR

6.2.9.24.2.2 Perform the following on the DSKY:

VERB 16 NOUN 91 ENTR

Record R1 and R2 when the values settle out.

6.2.9.24.2.3 Set the OPTICS ZERO switch to ZERO.

6.2.9.24.2.4 Perform the following on the DSKY after a 10-second delay:

VERB 24 NOUN 01 ENTR
00053 ENTR
00360 ENTR
00360 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00002 ENTR/ENTR
00014 ENTR
06000 ENTR

6.2.9.24.2.5 Set the OPTICS ZERO switch on the Indicator Control Panel to OFF.

6.2.9.24.2.6 Press the Key Release pushbutton. Record R1 and R2 when they are settled out.

6.2.9.24.2.7 Perform the following calculations for Shaft and Trunnion. Subtract the values of R1 and R2 from Step 6.2.9.24.2.2 from the respective values of R1 and R2 of Step 6.2.9.24.2.6.

Verify $R1_6 - R1_2 = 10.65$ deg ±1.00 deg.
and $R2_6 - R2_2 = 2.66$ deg ±0.26 deg

6.2.9.24.3 Set the SPEED switch to "MED" and the DIRECT/RESOLVED switch to DIRECT.

6.2.9.24.4 Set the OPTICS Hand Controller full right. Record R1 and release the Hand Controller.

6.2.9.24.4.1 Set the OPTICS Hand Controller full left. Record R1 and release the Hand Controller.

6.2.9.24.4.2 Perform the following calculations for Shaft. Subtract the value of R1 from Step 6.2.9.24.2.6 ($R1_{26}$) from the value of R1 recorded in Step 6.2.9.24.4 ($R1_{40}$).

Verify $R1_{40} - R1_{26} = 1.63$ deg ±0.49 deg.

Subtract the value of R1 from Step 6.2.9.24.2.6 ($R1_{26}$) from the value of R1 recorded in Step 6.2.9.24.4.1 ($R1_{41}$).

Verify $R1_{41} - R1_{26} = -1.63$ deg ±0.49 deg.

6.2.9.24.4.3 Set the OPTICS Hand Controller full up. Record R2 and release the Hand Controller.

6.2.9.24.4.4 Set the OPTICS Hand Controller full down. Record R2 and release the Hand Controller.

6.2.9.24.4.5 Perform the following calculations for Trunnion. Subtract the value of R2 from Step 6.2.9.24.2.6 ($R2_{26}$) from the value of R2 recorded in Step 6.2.9.24.4.3 ($R2_{43}$).

Verify $R2_{43} - R2_{26} = 0.40$ deg ±0.12 deg.

Subtract the value of R2 from Step 6.2.9.24.2.6 ($R2_{26}$) from the value of R2 recorded in Step 6.2.9.24.4.4 ($R2_{44}$).

Verify $R2_{44} - R2_{26} = -0.40$ deg ±0.12 deg.

6.2.9.24.5 Perform the following on the DSKY:

VERB 21 NOUN 10 ENTR
00012 ENTR
00000 ENTR

6.2.9.25 Set the G/N Power-Optics Switch on the LEB lighting control panel to OFF.

6.2.10 Zero Optics Test

6.2.10.1 Set the G&N POWER-OPTICS switch on the LEB to OPTICS. Verify Power Supplies.

NOTE: Proceed with this test if 6.2.3 Operate Power on test has been completed and system operation has not been interrupted. If system operation has been interrupted perform 6.2.5.2. Turn On Procedure before proceeding.

INITIALIZATION

6.2.10.2 Insure that the following switches on the G&N Indicator Control Panel are set as follows:

a. OPTICS TEL TRUN to SLAVE to SXT
b. OPTICS COUPLING to DIRECT
c. OPTICS SPEED to HI
d. OPTICS MODE to MAN

OPTICS ZERO MODE TEST

6.2.10.3 Monitor the Optics CDU's by entering VERB 16 NOUN 91 ENTER into K-148.

6.2.10.4 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Indicator Control Panel to ZERO. Wait 15 seconds. Verify the Optics have zeroed properly by observing the following on R1 and R2 of the CRT.

a. R1 = +0.00° +0.02°, -0.03° (Shaft Angle)
b. R2 = +0.000° +0.006°, -0.007° (Trunnion Los Angle)

6.2.10.4.1 Enter the following:

VERB 01 NOUN 10, ENTER
00033 ENTER

Verify R1 = XXX6X

6.2.10.4.2 Set the OPTICS ZERO switch to OFF and the OPTICS MODE switch to CMC. Enter the following:

ENTER
00033, ENTER

Verify R1 = XXX5X

6.2.10.4.3 Set the OPTICS MODE switch to MAN. Press the KEY-REL pushbutton.

OPTICS BACKUP MODE TEST

6.2.10.5 Insert the Inflight Tool (V36601405) into the Trunnion Tool input and engage drive mechanism (button out). Verify that the trunnion turns by viewing the movement through the SCT eyepiece while turning the tool until the TPAC reads +5°. Remove the tool from the Trunnion tool input.

6.2.10.6 Insert the Inflight Tool (V36601405) into the Shaft Tool input and engage the drive mechanism (button out). Verify that the Shaft turns by viewing the movement through the SCT eyepiece while turning the tool so that the shaft moves through an angle from 0° to +3° to 0° as indicated on the shaft TPAC. Disengage the shaft drive mechanism (button in) and remove the tool.

6.2.10.7 Insert the Inflight Tool (V36601405) into the Trunnion Tool input. Verify that the Trunnion turns by viewing the movement through the SCT eyepiece while turning the tool so that the trunnion moves from +5° to -5° and back to zero as indicated on the Trunnion TPAC. Disengage the trunnion drive mechanism (button in) and remove the tool.

6.2.11 Optics Coordinate Transformation Control Test.

6.2.11.1 Set the G/N POWER-OPTICS switch on the LEB to OPTICS. Verify Power Supplies.

NOTE: Proceed with this test if 6.2.3 Operate Power On Test has been completed and system operation has not been interrupted. If system operation has been interrupted, perform 6.2.5.2, Turn On Procedure, before proceeding.

INITIALIZATION

6.2.11.2 Verify and/or set the following switches on the G&N Indicator Control Panel to the position indicated.

a. OPTICS TEL TRUN to SLAVE to SXT
b. OPTICS COUPLING to DIRECT
c. OPTICS SPEED to HI
d. OPTICS MODE to MAN

6.2.11.3 Enter the following into K-148:

VERB 16 NOUN 91 ENTR

6.2.11.4 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Panel to ZERO. Wait 15 seconds. Return the OPTICS ZERO switch to OFF.

6.2.11.5 Set up the analog recorders to monitor the following measurements:

a. CG 3170 SCT Trunnion Tachometer Output

RESOLVED MODE PHASING AND IMAGE RATE TEST.

6.2.11.6 Using the OPTICS CONTROL STICK, drive the Optics until R1 = +225.00 and R2 = +10.000 on the CRT and the DSKY's.

6.2.11.7 Set the OPTICS COUPLING switch on the G&N Panel to RSLV and the OPTICS Speed switch to MED.

6.2.11.8 Position the movable optics target such that it is centered on the SCT reticle pattern.

6.2.11.9 Record time. Quickly displace the OPTICS CONTROL STICK 45±10 degrees in the upper right hand quadrant while sighting on the optics target through the SCT eyepiece. The target shall appear to move in the upper right field of view of the SCT at 45±10 deg. When target leaves the SCT upper right field of view press MARK pushbutton. The PROG alarm lamp shall light.

6.2.11.10 From the uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the Shaft CDU register (address 36) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) and the PROG alarm discrete for the period during which the OPTICS CONTROL STICK was being displaced above. The Shaft CDU angle shall be 225.00±10.00 degrees at the time the PROG alarm occurred. The elapsed time from time of OPTICS CONTROL STICK displacement to the time the PROG alarm discrete is obtained shall be 19 to 32 seconds.

6.2.11.11 Set the OPTICS COUPLING switch to DIRECT. Again using the OPTICS CONTROL STICK, drive the optics until R1 = +225.00 and R2 = +10.000. Set the OPTICS COUPLING switch to RSLV.

6.2.11.12 While sighting on the optical target through the SCT eyepiece, displace the OPTICS CONTROL STICK fully to the right. Verify that the target image appears to move in a straight line horizontally to the right and release the OPTICS CONTROL STICK when the target image reaches the edge of the SCT field of view.

6.2.11.13 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS COUPLING switch on the G&N Panel to DIRECT. Set the OPTICS ZERO switch to ZERO.

6.2.12 Optics Functional Test

6.2.12.1 Set/verify the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify the following:

a. +28 VDC OPTX OPERATE BUS (CG 1530) is 28.8±3 VDC. Record the indication on the CRT.

b. CG 1211 OPTX 28V 800 cps 1% 0 ph not flashing on CRT.

c. CG 1212 OPTX 800 cps 5% -90 ph not flashing on CRT.

6.2.12.2 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Insure that the Optics control switches on the G&N Indicator Control Panel are set as follows:

a. OPTICS ZERO to ZERO
b. OPTICS MODE to MAN
c. OPTICS SPEED to LO
d. OPTICS COUPLING to DIRECT
e. OPTICS TRUN to SLAVE to SXT

6.2.12.3 Set OPTICS ZERO switch to OFF.

6.2.12.4 Resolution checks

6.2.12.4.1 SXT Resolution Check - MSO only

6.2.12.4.1.1 Sight through the SXT eyepiece. Using the OPTICS CONTROL STICK adjust the SXT to obtain the best reflected field of view of the 5-inch autocollimator reticle engravings at the center of view.

6.2.12.4.1.2 Note that the autocollimator reticle contains a series of lines of different thickness and width. Each set of lines is marked with a number (20, 15, 10, 7, 5, 3) which indicates the angle subtended by one line and one space. View each set of lines to determine the lowest numbered set in which resolution between lines (ability to distinguish separate distinct lines within a set) can be made. Record the number associated with that set of lines. The SXT resolution shall be at least 10 arc seconds at the center of the field of view.

6.2.12.4.2 SCT Resolution Check

6.2.12.4.2.1 Sight through the SCT EYEPIECE. Using the OPTICS CONTROL STICK adjust the SCT to obtain the best view of the SCT RESOLUTION CHART held in the Optics line of sight.

6.2.12.4.2.2 Note the chart contains sets of lines. View each set of lines to determine the lowest numbered set in which the resolution between lines (ability to distinguish separate lines within a set) can be made. The SCT shall have a resolution of at least 3 arc minutes at the center of the field of view.

6.2.12.5 Slave Telescope Mode Checks

6.2.12.5.1 Verify/perform OPTICS POWER ON TEST per paragraph 6.2.3.2.

6.2.12.5.2 Set/verify following switches on G&N INDICATOR CONTROL PANEL:

a. OPTICS TEL TRUN - SLAVE to SXT
b. OPTICS COUPLING - DIRECT
c. OPTICS SPEED - HI

6.2.12.5.3 Monitor OCDU's by entering VERB 16 NOUN 91, ENTER into K-148.

6.2.12.5.4 Set OPTICS MODE to MAN.

6.2.12.5.5 Using the Optics Hand Controller drive the optics until:

R1 = +000.00±001.00 (SHAFT)
R2 = +10.000±01.000 (TRUNNION)

6.2.12.5.6 Verify on the CRT and Optics Panel:

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = R2 ±0.22 DEG

6.2.12.5.7 Set the OPTICS TEL TRUN on the G&N INDICATOR CONTROL PANEL to 0°.

6.2.12.5.8 Verify:

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = 0.0° ±0.22 DEG

R2 approximately equal to value specified in step 6.2.12.5.5.

6.2.12.5.9 Set the OPTICS TEL TRUN on the G&N INDICATOR CONTROL PANEL to OFFSET 25°.

6.2.12.5.10 Verify on CRT and Optics Panel:

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = 25° ±1.00 DEG
R2 approximately equal to value specified in step 6.2.12.5.5.

6.2.12.5.11 On the G&N INDICATOR CONTROL PANEL set the OPTICS TEL TRUN to SLAVE to SXT.

6.2.12.5.12 Verify on CRT and Optics Panel:

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = R2 ±0.22 DEG

6.2.12.5.13 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). On the G&N INDICATOR CONTROL PANEL set the OPTICS ZERO to ZERO. Wait 15 sec.

6.2.12.5.14 Verify on CRT and OPTICS PANEL.

R1 = 000.00 +000.02, -000.03
R2 = 00.000 +00.006, -00.007

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = R2 ±0.22 DEG

6.2.12.5.15 If Optics testing will not be continued, set the G&N POWER-OPTICS switch on the LEB Lighting Control Panel to OFF.

6.2.12.6 SXT Parallelism Tests

6.2.12.6.1 Remove the plug from the base of the SXT eyepiece and install the Adapter Assembly and Portable Light Assembly. Turn on the light.

NOTE: If needed to reduce external light, place a photographers hood over the optics head.

6.2.12.6.2 SXT Auto Collimator Parallelism Test - MSO only.

6.2.12.6.2.1 Using the OPTICS CONTROL STICK drive the SXT StLOS Trunnion to +15.00° ±2° as indicated in R2 of the DSKY. Maintain a Shaft CDU angle of 000.00±0.10 degrees.

6.2.12.6.2.2 Sight through the 5-inch autocollimator eyepiece and adjust the measurement knob to superimpose the SXT LLOS horizontal reticle image upon the autocollimator horizontal filar. Record the autocollimator reading.

6.2.12.6.2.3 Repeat 6.2.12.6.2.2 twice. Calculate and record the average of the three autocollimator readings.

6.2.12.6.2.4 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO.

6.2.12.6.2.5 Again sight through the 5-inch autocollimator eyepiece and adjust the measurement knob to bring the SXT StLOS horizontal reticle and autocollimator horizontal filar images to coincide. Record the autocollimator reading.

6.2.12.6.2.6 Repeat 6.2.12.6.2.5 twice. Calculate and record the average of the three autocollimator readings. The average value obtained here shall not differ from that obtained in 6.2.12.1 by more than 10 arc seconds.

6.2.12.7 SXT, CMC Functional Check

6.2.12.7.1 Set the OPTICS MODE switch to MAN. Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT).

Set the OPTICS ZERO switch to ZERO. After 15 seconds, return the switch to OFF.

6.2.12.7.2 Sight through the SXT. Using the Control Stick align the SXT StLOS with Optical Target No. 1.

6.2.12.7.3 When aligned, record the value of the Shaft and Trunnion CDU's from the CRT.

6.2.12.7.4 Sight through the SXT. Using the Control Stick align the SXT StLOS with Optical Target No. 2.

6.2.12.7.5 When aligned, record the value of the Shaft and Trunnion CDU's from the CRT.

6.2.12.7.6 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Indicator Control Panel to ZERO. After 15 seconds set the OPTICS ZERO switch to OFF. Set the OPTICS MODE switch to CMC.

6.2.12.7.7 Enter VERB 41, NOUN 91, ENTER into the DSKY. Enter the value for Shaft from 6.2.12.7.3 into the DSKY and press ENTER. Enter the value for Trunnion from 6.2.12.7.3 into the DSKY and press ENTER.

6.2.12.7.8 Sight through the SXT. The StLOS should be approximately centered on the Optical Target No. 1. Record the value of Shaft and Trunnion CDU's from the CRT. The difference between these values and the corresponding values recorded in 6.2.12.7.3 shall be less than 0.06 degrees for the Shaft and 0.02 degrees for the Trunnion. Record the difference.

6.2.12.7.9 Enter VERB 41, NOUN 91, ENTER into the DSKY. Enter the value for Shaft from 6.2.12.7.5 into the DSKY and press the ENTER pushbutton. Enter the value for Trunnion from 6.2.12.7.5 into the DSKY and press the ENTER pushbutton.

6.2.12.7.10 Sight through the SXT. The StLOS should be approximately centered on the Optical Target No. 2. Record the value of Shaft and Trunnion CDU's from the CRT. The difference between these values and the corresponding values recorded in 6.2.12.7.5 shall be less than 0.06 degrees for the Shaft and 0.02 degrees for the Trunnion. Record the difference.

6.2.12.7.11 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds.

6.2.12.7.12 If OPTICS testing will not continue, set the G&N Power Optics switch on the LEB Lighting Panel to OFF.

6.2.13 Optics Slew Rate Test

6.2.13.1 Set/Verify the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify the following signals on the CRT.

a. +28 VDC OPTICS OPERATE BUS (CG 1530) is +29.0±3.0 VDC.
b. OPTX 28V 800 cps 1% 0° ph not flashing on the CRT.
c. OPTX 28V 800 cps 5% -90° ph not flashing on the CRT.

6.2.13.1.1 Verify and/or set the following switches on the G&N Indicator Control Panel to the positions indicated:

a. OPTICS TEL TRUN to SLAVE to SXT
b. OPTICS COUPLING to DIRECT
c. OPTICS SPEED to HI
d. OPTICS MODE to MAN.

6.2.13.2 Monitor the OCDU's by entering VERB 16 NOUN 91, ENTER into K148. Insure RECORD DSKY and RECORD DOWNLINK on R-145 are ON.

6.2.13.3 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Indicator Control Panel to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch on the G&N Indicator Panel to OFF. Set the OPTICS MODE switch to MAN.
TRUNNION SLEW RATE - HI SPEED

6.2.13.4 NOTE: Read and understand the entire step before proceeding. Do not hold Control Stick at upper limit more than 10 seconds or exceed a trunnion angle of 85°.

TRUNNION SLEW RATE - HI SPEED

Record time. Push and hold the Optics Control Stick to its upper limit. After approximately 7 seconds release the control stick. Record the SXT Trunnion Servo Error In-Phase output (CG 3118) and SXT Trun Tach (CG 3150) signals on the CRT while slewing the optics. The CG 3118 shall be -0.25 to -2.00 VRMS. CG 3150 shall be 3.3±1.3 VRMS.

6.2.13.5 Perform the following calculations:
From the Uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the trunnion CDU register (address 35) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 7 second period during which the rate test was being performed.

Calculate the slew rate by dividing the ΔCDU angle by the elapsed time.

The Trunnion slew rate shall be 10.0±2.0 deg/sec.

SHAFT SLEW RATE - HI SPEED

6.2.13.6 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF.

6.2.13.7 NOTE: Read and understand the entire step before proceeding. Do not hold Control Stick at right limit for more than 10 seconds or exceed a shaft angle of 250°.

Record time. Push and hold the Optics Control stick to its right limit. After approximately 7 seconds release the control stick.

Record the SXT Shaft Servo Error In-Phase Output (CG 3117) and SXT Shaft Tach (CG 3140) signals on the CRT while slewing the optics. CG 3117 shall be -0.25 to -2.00 VRMS. CG 3140 shall be 3.3±1.3 VRMS.

6.2.13.8 Perform the following calculations:

From the uplink file tape, the compressed data tape or the PCM tape, request a data reduction of the Shaft CDU register (address 36) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 7 second period during which the rate test was being performed.

Calculate the rate by dividing the ΔCDU angle by the elapsed time.

The Shaft slew rate shall be 19.5±3.9 deg/sec.

TRUNNION SLEW RATE - MED SPEED

6.2.13.9 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF. Set the OPTICS SPEED switch to MED.

6.2.13.10 NOTE: Read and understand the entire step before proceeding. Do not hold control stick at upper limit for more than 20 seconds.

Record time. Push and hold the Optics Control Stick to its upper limit. After approximately 12 seconds release the control stick. Record the SXT TRUN MTR Control Winding (CG 3155) signal while slewing the optics. CG 3155 shall be +0.25 to +2.00 VRMS.

6.2.13.11 Perform the following calculations:

From the uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the Trunnion CDU registers (address 35) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 12 second period during which the rate test was being performed.

Calculate the rate by dividing the ΔCDU angle by the elapsed time.

The trunnion slew rate shall be 1.0±0.2 deg/sec.

SHAFT SLEW RATE - MED SPEED

6.2.13.12 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF.

6.2.13.13 NOTE: Read and understand the entire step before proceeding. Do not hold control stick at right limit for more than 20 seconds.

Record time. Push and hold the Optics Control Stick to its right limit. After approximately 12 seconds release the control stick. Record the SXT Shaft MTR Control Winding (CG 3145) signal while slewing the optics. CG 3145 shall be +0.50 to +4.00 VRMS.

6.2.13.14 Perform the following calculations:

From the uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the CDU register (address 36) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 12 second period during which the rate test was being performed.

Calculate the rate by dividing the ΔCDU angle by the elapsed time.

The Shaft slew rate shall be 2.0±0.4 deg/sec.

TRUNNION SLEW RATE - LO SPEED

6.2.13.15 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF. Set the OPTICS SPEED switch to LO.

6.2.13.16 NOTE: Read and understand the entire step before proceeding. Do not hold control stick at upper limit for more than 30 seconds.

Record time. Push and hold the Optics Control Stick to its upper limit. After approximately 12 seconds release the control stick.

6.2.13.17 Perform the following calculations:

From the uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the Trunnion CDU register (address 35) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 12 second period during which the rate test was being performed.

Calculate the rate by dividing the ΔCDU angle by the elapsed time.

The Trunnion slew rate shall be 0.10±0.02 deg/sec.

SHAFT SLEW RATE - LO SPEED

6.2.13.18 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF.

6.2.13.19 NOTE: Read and understand the entire step before proceeding. Do not hold control stick at right limit for more than 20 seconds.

Record time. Push and hold the Optics Control Stick to its right limit. After approximately 12 seconds release the control stick.

6.2.13.20 Perform the following calculations:

From the uplink file tape, the compressed data tape, or the PCM tape request data reduction of the CDU register (address 36) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 12 second period during which the rate test was being performed.

Calculate the rate by dividing the ΔCDU angle by the elapsed time.

The Shaft slew rate shall be 0.20±0.04 deg/sec.

OPTICS HAND CONTROLLER DRIFT RATE CHECK - LO SPEED

6.2.13.21 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT.) Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF. Record time. Wait 60 seconds.

6.2.13.22 Perform the following calculations:

From the uplink file tape,the compressed data tape,or the PCM tape request a data reduction of the Trunnion and Shaft CDU registers (addresses 35 and 36 respectively) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 60 second period during which the drift rate test was being performed.

Calculate the drift rate by dividing the ΔCDU angles by the elapsed time.

The Trunnion drift rate shall be less than .0167 deg/sec.

The Shaft drift rate shall be less than .0333 deg/sec.

6.2.13.23 If OPTICS testing will not continue; set the G/N Power-Optics switch on the LEB Lighting Control Panel to OFF.

6.2.14 Stabilization Loop Step Response Test

6.2.14.1 Proceed with this test if the Operate Power On Test of 6.2.3 has been performed and system operation has not been interrupted. If system operation has been interrupted, perform the Turn On Procedure of 6.2.5.2 before proceeding.

6.2.14.2 Insure that the Carry-on Command Stimuli Unit, Model No. C14-200, is installed and connected.

6.2.14.3 Enter VERB 36 into K148. Press the ENTER pushbutton, then the ERROR RESET pushbutton.

6.2.14.4 Inner Gimbal Response Test.

6.2.14.4.1 Enter code 2032000000 in C-START Module. Press the XEQ/SEAL pushbutton to call up CG 2117 IGA SERVO ERROR.

6.2.14.4.2 Enter the following into K148:

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.14.4.3 Wait 15 seconds.

6.2.14.4.4 Enter VERB 40 NOUN 20, ENTER into K148. Wait 15 seconds.

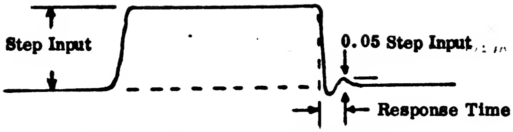
6.2.14.4.5 Deleted.

6.2.14.4.6 Enter 1000 into R155. Verify and execute to enter a DC step into the IG stabilization loop.

CAUTION: If the transient caused by the step input does not settle within 15 seconds, remove the IMU OPERATE power by setting the G/N POWER IMU switch on the LEB Lighting Control Panel to OFF.

6.2.14.4.7 Enter 0000 into R155; the top part of switch should be extinguished. Insure that no other function switches on R155 are illuminated. Start analog recorder. Press the XEQ/SEAL pushbutton to remove the step input to the IG Stabilization Loop. The bottom part of switch shall be extinguished.

6.2.14.4.8 After the transient has settled, stop the analog recorder. Record the loop response time by measuring the time interval between removing the step (initial disturbance) and the settling of the error signal to a value equal to ±5% of the original step amplitude. In addition, record the total number of overshoots. See Figure 2 for typical step input response.



TYPICAL STEP INPUT RESPONSE

FIGURE 2

6.2.14.4.8.1 The inner gimbal stabilization loop response time shall be less than 0.1 second.

6.2.14.4.8.2 The maximum number of overshoots on the IGA Servo Error Signals shall be three.

6.2.14.5 Middle Gimbal Response Test.

6.2.14.5.1 Enter code 2028000000 into C-START MODULE. Press the XEQ/SEAL pushbutton to call up CG 2147 MGA SERVO ERROR.

6.2.14.5.2 Enter the following into K148:

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.14.5.3 Wait 15 seconds.

6.2.14.5.4 Enter VERB 40 NOUN 20 ENTER into K148. Wait 15 seconds.

6.2.14.5.5 Enter 0100 into R155. The top part of switch shall be illuminated. Insure that no other function switches on R155 are illuminated.

6.2.14.5.6 Press XEQ/SEAL pushbutton on R155 to enter a DC step into the MG Stabilization Loop.

CAUTION: If the transient caused by the step input does not settle within 15 seconds, remove the IMU OPERATE power by setting the G/N POWER IMU switch on the LEB Lighting Control Panel to OFF.

6.2.14.5.7 Enter 0000 into R155. The top part of the switch shall be extinguished. Insure that no other function switches on R155 are illuminated. Start analog recorder. Press XEQ/SEAL pushbutton to remove the step inputs to the MG stabilization loop.

6.2.14.5.8 After the transients have settled, stop the analog recorder. Record the loop response time by measuring the time interval between removing the step (initial disturbance) and the settling of the error signal to a value equal to ±5% of the original step amplitude. In addition, record the total number of overshoots.

6.2.14.5.8.1 The middle gimbal stabilization loop response time shall be less than 0.1 second.

6.2.14.5.8.2 The maximum number of overshoots on the MGA Servo Error signals shall be three.

6.2.14.6 Outer Gimbal Response Test.

6.2.14.6.1 Enter code 2026000000 in C-START Module. Press XEQ/SEAL Pushbutton to call up CG 2177 OGA SERVO ERROR.

6.2.14.6.2 Enter the following into K148:

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.14.6.3 Wait 15 seconds.

6.2.14.6.4 Enter VERB 40 NOUN 20, ENTER into K148. Wait 15 seconds.

6.2.14.6.5 Enter 0010 into R155. The top half of the switch shall be illuminated. Insure that no other function switches on R155 are illuminated.

6.2.14.6.6 Press XEQ/SEAL pushbutton on R155 to enter a DC step into the OG Stabilization Loops.

NOTE: If the transient caused by the step input does not settle within 15 seconds, remove the IMU OPERATE power by setting the G/N POWER IMU switch on the LEB Lighting Control Panel to OFF.

6.2.14.6.7 Enter 0000 into R155. The top half of the switch shall be extinguished. Insure that no other function switches on R155 are illuminated. Start analog recorder. Press the XEQ/SEAL pushbutton to remove the step input to the OG Stabilization Loop.

6.2.14.6.8 After the transients have settled out, stop the analog recorder. Record the loop response time by measuring the time interval between removing the step (initial disturbance) and the settling of the error signal to a value equal to ±5% of the original step amplitude. In addition, record the total number of overshoots.

6.2.14.6.8.1 The outer gimbal stabilization loop response time shall be less than 0.1 second.

6.2.14.6.8.2 The maximum number of overshoots on the OGA Servo Error Signals shall be five.

6.2.14.7 Enter VERB 40 NOUN 20 into K148. Press the ENTER pushbutton. Wait 15 seconds.

6.2.14.7.1 Enter the following into K148:

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.14.7.2 Deleted.

6.2.15 IRIG Scale Factor Test

6.2.15.1 Verify the appropriate K-START tape for IRIG Scale Factor Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.15.2 Start tape reader.

6.2.15.2.1 When tape reader stops verify the following on the CRT DSKY display:

a. R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
b. R2 = +00083 (tape number)
c. R3 = -YYYZX (X is the tape revision number, YYY is the spacecraft number when assigned, and Z is the revision to the rope revision number and has meaning for tapes in Section B of Appendix II).

6.2.15.2.2 Start tape reader.

6.2.15.2.3 When tape reader stops, wait 20 seconds.

6.2.15.3 E-Memory Program Load.

6.2.15.3.1 Start tape reader.

6.2.15.3.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00000.

6.2.15.4 Test Position Data Load (+X Scale Factor)

6.2.15.4.1 Start tape reader.

6.2.15.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.2.15.4.3 Start tape reader.

6.2.15.4.4 When tape reader stops, VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nave Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.4.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.4.6 In approximately 120 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001).

6.2.15.5 Test Position Data Load (+Y Scale Factor)

6.2.15.5.1 Start tape reader.

6.2.15.5.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.2.15.5.3 Start tape reader.

6.2.15.5.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.5.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.5.6 In approximately 120 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.2.15.6 Test Position Data Load (+Z Scale Factor).

6.2.15.6.1 Start tape reader.

6.2.15.6.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.2.15.6.3 Start tape reader.

6.2.15.6.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.6.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.6.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.2.15.7 Test Position Data Load (-X Scale Factor)

6.2.15.7.1 Start tape reader.

6.2.15.7.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.2.15.7.3 Start tape reader.

6.2.15.7.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.7.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.7.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.2.15.8 Test Position Data Load (-Y Scale Factor)

6.2.15.8.1 Start tape reader.

6.2.15.8.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.2.15.8.3 Start tape reader.

6.2.15.8.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTER into K-148 and enter correct azimuth.

6.2.15.8.4 (continued) If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.8.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.8.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.2.15.9 Test Position Data Load (-Z Scale Factor)

6.2.15.9.1 Start tape reader.

6.2.15.9.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.2.15.9.3 Start tape reader.

6.2.15.9.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.9.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.9.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.2.15.10 Test Position Data Load (+X Scale Factor)

6.2.15.10.1 Start tape reader.

6.2.15.10.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.2.15.10.3 Start tape reader.

6.2.15.10.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.10.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.10.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.2.15.11 Test Position Data Load (+Y Scale Factor)

6.2.15.11.1 Start tape reader.

6.2.15.11.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.2.15.11.3 Start tape reader.

6.2.15.11.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.11.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.11.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.2.15.12 Test Position Data Load (+Z Scale Factor)

6.2.15.12.1 Start tape reader.

6.2.15.12.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.2.15.12.3 Start tape reader.

6.2.15.12.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.12.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.12.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.2.15.13 Test Position Data Load (-X Scale Factor)

6.2.15.13.1 Start tape reader.

6.2.15.13.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.2.15.13.3 Start tape reader.

6.2.15.13.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.13.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.13.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.2.15.14 Test Position Data Load (-Y Scale Factor)

6.2.15.14.1 Start tape reader.

6.2.15.14.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.2.15.14.3 Start tape reader.

6.2.15.14.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.14.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.14.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.2.15.15 Test Position Data Load (-Z Scale Factor)

6.2.15.15.1 Start tape reader.

6.2.15.15.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.2.15.15.3 Start tape reader.

6.2.15.15.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

6.2.15.15.4 (continued) If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.15.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.15.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.2.15.16 Test Position Data Load (+X Scale Factor)

6.2.15.16.1 Start tape reader.

6.2.15.16.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00001.

6.2.15.16.3 Start tape reader.

6.2.15.16.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.16.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.16.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.2.15.17 Test Position Data Load (+Y Scale Factor)

6.2.15.17.1 Start tape reader.

6.2.15.17.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.2.15.17.3 Start tape reader.

6.2.15.17.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.17.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.17.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.2.15.18 Test Position Data Load (+Z Scale Factor)

6.2.15.18.1 Start tape reader.

6.2.15.18.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.2.15.18.3 Start tape reader.

6.2.15.18.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.18.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.18.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.2.15.19 **Test Position Data Load (-X Scale Factor)**

6.2.15.19.1 Start tape reader.

6.2.15.19.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.2.15.19.3 Start tape reader.

6.2.15.19.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.19.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.19.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.2.15.20 **Test Position Data Load (-Y Scale Factor)**

6.2.15.20.1 Start tape reader.

6.2.15.20.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.2.15.20.3 Start tape reader.

6.2.15.20.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.20.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.20.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.2.15.21 Test Position Data Load (-Z Scale Factor)

6.2.15.21.1 Start tape reader.

6.2.15.21.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.2.15.21.3 Start tape reader.

6.2.15.21.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.21.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.21.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.2.15.22 Test Position Data Load (+X Scale Factor)

6.2.15.22.1 Start tape reader.

6.2.15.22.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00001.

6.2.15.22.3 Start tape reader.

6.2.15.22.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

6.2.15.22.4 (continued) If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.22.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.22.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.2.15.23 Test Position Data Load (+Y Scale Factor)

6.2.15.23.1 Start tape reader.

6.2.15.23.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.2.15.23.3 Start tape reader.

6.2.15.23.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.23.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.23.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.2.15.24 Test Position Data Load (+Z Scale Factor)

6.2.15.24.1 Start tape reader.

6.2.15.24.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.2.15.24.3 Start tape reader.

6.2.15.24.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.24.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.24.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.2.15.25 Test Position Data Load (-X Scale Factor)

6.2.15.25.1 Start tape reader.

6.2.15.25.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.2.15.25.3 Start tape reader.

6.2.15.25.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.25.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.25.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.2.15.26 Test Position Data Load (-Y Scale Factor)

6.2.15.26.1 Start tape reader.

6.2.15.26.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.2.15.26.3 Start tape reader.

6.2.15.26.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.26.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.26.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.2.15.27 Test Position Data Load (-Z Scale Factor)

6.2.15.27.1 Start tape reader.

6.2.15.27.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.2.15.27.3 Start tape reader.

6.2.15.27.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.27.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.27.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.2.15.28 Terminate this test by entering the following into K-148:

VERB 36	ENTR	Wait 10 seconds.
VERB 41 NOUN 20	ENTR	
+00000	ENTR	
+00000	ENTR	
+00000	ENTR	

6.2.15.29 The four-run average Scale Factor Error for each of the six positions shall be 0 plus or minus 1750 ppm.

6.2.16 IMU Performance Test. A reference data sheet is provided at the end of this section to aid in data reduction.

6.2.16.1 Insure that IMU Operate power and LGC Operate power has been supplied for a minimum of one hour and that the IMU is not in a Gimbal Lock condition.

6.2.16.2 On CRT, monitor and record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.2.16.3 Verify the appropriate K-START tape for IMU Performance Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.16.4 Start tape reader.

6.2.16.4.1 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
b. R2 = +00081 (tape number)
c. R3 = -YYYZX (X is the tape revision number, YYY is the spacecraft number when assigned, and Z is the revision to the rope revision number and has meaning for tapes in Section B of Appendix II).

6.2.16.4.2 Start tape reader.

6.2.16.4.3 When tape reader stops, wait 15 seconds.

6.2.16.5 Start the tape reader. After 15 seconds, verify IMU is coarse aligned to zero degrees.

6.2.16.6 E-Memory Program Load.

6.2.16.6.1 Start the tape reader. When tape reader stops, verify the following DSKY display:

Row 1
Row 3

6.2.16.7 Test Position +00001.

6.2.16.7.1 E-Memory Program and Test Position Matrix Sum Check

6.2.16.7.1.1 Start tape reader.

6.2.16.7.1.2 When tape reader stops, verify DSKY Row 1 displays +00001.

6.2.16.7.2 Start tape reader.

6.2.16.7.2.1 When tape reader stops wait 20 seconds.

6.2.16.7.3 Test Initialization.

6.2.16.7.3.1 Start tape reader.

6.2.16.7.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.7.4 Horizontal Drift Test

6.2.16.7.4.1 Start tape reader.

6.2.16.7.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.7.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.7.5 Test Termination.

6.2.16.7.5.1 Start tape reader.

6.2.16.7.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.8 Test Position +00002.

6.2.16.8.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.8.1.1 Start tape reader.

6.2.16.8.1.2 When tape reader stops, verify DSKY Row 1 displays +00002.

6.2.16.8.2 Start tape reader.

6.2.16.8.2.1 When tape reader stops, wait 20 seconds.

6.2.16.8.3 Test Initialization.

6.2.16.8.3.1 Start tape reader.

6.2.16.8.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.8.4 Horizontal Drift Test.

6.2.16.8.4.1 Start tape reader.

6.2.16.8.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.8.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.8.5 PIPA Scale Factor Test.

6.2.16.8.5.1 Start tape reader.

6.2.16.8.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.2.16.8.6 Vertical Drift Test.

6.2.16.8.6.1 Start tape reader.

6.2.16.8.6.2 In approximately 67 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.2.16.8.7 Test Termination.

6.2.16.8.7.1 Start tape reader.

6.2.16.8.7.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.9 Test Position +00003.

6.2.16.9.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.9.1.1 Start tape reader.

6.2.16.9.1.2 When tape reader stops, verify DSKY Row 1 displays +00003.

6.2.16.9.2 Start tape reader.

6.2.16.9.2.1 When tape reader stops, wait 20 seconds.

6.2.16.9.3 Test Initialization.

6.2.16.9.3.1 Start tape reader.

6.2.16.9.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.9.4 Horizontal Drift Test

6.2.16.9.4.1 Start tape reader.

6.2.16.9.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.9.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.9.5 Test Termination.

6.2.16.9.5.1 Start tape reader.

6.2.16.9.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.10 Test Position +00004.

6.2.16.10.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.10.1.1 Start tape reader.

6.2.16.10.1.2 When tape reader stops, verify DSKY Row 1 displays +00004.

6.2.16.10.2 Start tape reader.

6.2.16.10.2.1 When tape reader stops, wait 20 seconds.

6.2.16.10.3 Test Initialization.

6.2.16.10.3.1 Start tape reader.

6.2.16.10.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.10.4 Horizontal Drift Test.

6.2.16.10.4.1 Start tape reader.

6.2.16.10.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.10.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.2.16.10.5 PIPA Scale Factor Test.

6.2.16.10.5.1 Start tape reader.

6.2.16.10.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.2.16.10.6 Vertical Drift Test.

6.2.16.10.6.1 Start tape reader.

6.2.16.10.6.2 In approximately 67 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.2.16.10.7 Test Termination.

6.2.16.10.7.1 Start tape reader.

6.2.16.10.7.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.11 Test Position +00005.

6.2.16.11.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.11.1.1 Start tape reader.

6.2.16.11.1.2 When tape reader stops, verify DSKY Row 1 displays +00005.

6.2.16.11.2 Start tape reader.

6.2.16.11.2.1 When tape reader stops, wait 20 seconds.

6.2.16.11.3 Test Initialization.

6.2.16.11.3.1 Start tape reader.

6.2.16.11.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.11.4 **PIPA Scale Factor Test**

6.2.16.11.4.1 Start tape reader. Record time.

6.2.16.11.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM and GIMBAL LOCK lamps shall be lit.

6.2.16.11.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.2.16.11.5 Test Termination.

6.2.16.11.5.1 Start tape reader.

6.2.16.11.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.12 Test Position +00006.

6.2.16.12.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.12.1.1 Start tape reader.

6.2.16.12.1.2 When tape reader stops, verify DSKY Row 1 displays +00006.

6.2.16.12.2 Start tape reader.

6.2.16.12.2.1 When tape reader stops, wait 20 seconds.

6.2.16.12.3 Test Initialization.

6.2.16.12.3.1 Start tape reader.

6.2.16.12.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.12.4 PIPA Scale Factor Test.

6.2.16.12.4.1 Start tape reader. Record time.

6.2.16.12.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM and GIMBAL LOCK lamps shall be lit.

6.2.16.12.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.2.16.12.5 Test Termination.

6.2.16.12.5.1 Start tape reader.

6.2.16.12.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.13 Test Position +00007.

6.2.16.13.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.13.1.1 Start tape reader.

6.2.16.13.1.2 When tape reader stops verify DSKY Row 1 displays +00007.

6.2.16.13.2 Start tape reader.

6.2.16.13.2.1 When tape reader stops, wait 20 seconds.

6.2.16.13.3 Test Initialization.

6.2.16.13.3.1 Start tape reader.

6.2.16.13.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.13.4 Horizontal Drift Test.

6.2.16.13.4.1 Start tape reader.

6.2.16.13.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.13.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.2.16.13.5 Test Termination.

6.2.16.13.5.1 Start tape reader.

6.2.16.13.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.14 Test Position +00008.

6.2.16.14.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.14.1.1 Start tape reader.

6.2.16.14.1.2 When tape reader stops, verify DSKY Row 1 displays +00008.

6.2.16.14.2 Start tape reader.

6.2.16.14.2.1 When tape reader stops, wait 20 seconds.

6.2.16.14.3 Test Initialization.

6.2.16.14.3.1 Start tape reader.

6.2.16.14.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.14.4 Horizontal Drift Test

6.2.16.14.4.1 Start tape reader.

6.2.16.14.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish

6.2.16.14.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.14.5 Test Termination.

6.2.16.14.5.1 Start tape reader.

6.2.16.14.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.15. Test Position +00009.

6.2.16.15.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.15.1.1 Start tape reader.

6.2.16.15.1.2 When tape reader stops, verify DSKY Row 1 displays +00009.

6.2.16.15.2 Start tape reader.

6.2.16.15.2.1 When tape reader stops, wait 20 seconds..

6.2.16.15.3 Test Initialization.

6.2.16.15.3.1 Start tape reader.

6.2.16.15.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.15.4 Horizontal Drift Test.

6.2.16.15.4.1 Start tape reader.

6.2.16.15.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.15.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.15.5 Test Termination

6.2.16.15.5.1 Start tape reader.

6.2.16.15.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.16 Test Position +00010.

6.2.16.16.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.16.1.1 Start tape reader.

6.2.16.16.1.2 When tape reader stops, verify DSKY Row 1 displays +00010.

6.2.16.16.2 Start tape reader.

6.2.16.16.2.1 When tape reader stops, wait 20 seconds.

6.2.16.16.3 Test Initialization.

6.2.16.16.3.1 Start tape reader.

6.2.16.16.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.16.4 Horizontal Drift Test.

6.2.16.16.4.1 Start tape reader.

6.2.16.16.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.16.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.16.5 Test Termination.

6.2.16.16.5.1 Start tape reader.

6.2.16.16.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.17 Test Position +00011.

6.2.16.17.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.17.1.1 Start tape reader.

6.2.16.17.1.2 When tape reader stops, verify DSKY Row 1 displays +00011.

6.2.16.17.2 Start tape reader.

6.2.16.17.2.1 When tape reader stops, wait 20 seconds.

6.2.16.17.3 Test Initialization.

6.2.16.17.3.1 Start tape reader.

6.2.16.17.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.17.4 Horizontal Drift Test.

6.2.16.17.4.1 Start tape reader.

6.2.16.17.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.17.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.17.5 PIPA Scale Factor Test.

6.2.16.17.5.1 Start tape reader.

6.2.16.17.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.2.16.17.6 Test Termination.

6.2.16.17.6.1 Start tape reader.

6.2.16.17.6.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.18 Test Position +00012.

6.2.16.18.1 E-Memory Program and Test Position Matrix Sum Check

6.2.16.18.1.1 Start tape reader.

6.2.16.18.1.2 When tape reader stops, verify DSKY Row 1 displays +00012.

6.2.16.18.2 Start tape reader.

6.2.16.18.2.1 When tape reader stops, wait 20 seconds.

6.2.16.18.3 Test Initialization.

6.2.16.18.3.1 Start tape reader.

6.2.16.18.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

6.2.16.18.3.2 (continued) If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.18.4 Horizontal Drift Test.

6.2.16.18.4.1 Start tape reader.

6.2.16.18.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.18.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.18.5 PIPA Scale Factor Test.

6.2.16.18.5.1 Start tape reader.

6.2.16.18.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXX. and .XXXXX cm/sec/sec).

6.2.16.18.6 Test Termination.

6.2.16.18.6.1 Start tape reader.

6.2.16.18.6.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.19 Test Position +00013.

6.2.16.19.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.19.1.1 Start tape reader.

6.2.16.19.1.2 When tape reader stops, verify DSKY Row 1 displays +00013.

6.2.16.19.2 Start tape reader.

6.2.16.19.2.1 When tape reader stops, wait 20 seconds.

6.2.16.19.3 Test Initialization.

6.2.16.19.3.1 Start tape reader.

6.2.16.19.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.19.4 Horizontal Drift Test.

6.2.16.19.4.1 Start tape reader.

6.2.16.19.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.19.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.19.5 Test Termination.

6.2.16.19.5.1 Start tape reader.

6.2.16.19.5.2 When tape reader stops, wait 15 seconds before continuing.

6.2.16.20 On CRT, record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.2.16.21 Start Tape Reader.

6.2.16.22 Calculations.

NOTE: Use Post Vibration or System Test data points only.

6.2.16.22.1 Y PIPA Data Correction Calculation.

6.2.16.22.1.1 From the uplink file tape, the compressed data tape or the PCM tape, request a data reduction of the X and Z accelerometer ΔV counts (addresses 37 and 41, respectively) and the TIME 2 and TIME 1 registers (addresses 24 and 25, respectively) for the period during which the Y PIPA test was being performed in Positions 5 and 6 of the IMU Performance Test.

6.2.16.22.1.2 Perform the following calculations for Position 5.

$$G'_5 = (G_5 / \text{Cos } \theta y_5)$$

where:

G_5 = Measured acceleration term (line i)

G'_5 = Corrected acceleration term

$\text{Cos } \theta y_5 = 1 - (\theta^2 y_5 / 2)$ for small angles

$$\theta y_5 = \sqrt{\theta^2_{x5} + \theta^2_{z5}}$$

and:

$$\theta_{z5} = (\Delta V_{x5} - \Delta V_x \text{ Bias}) (\text{S.F.}_x) / (\Delta T) (\text{local g})$$

$$\theta_{x5} = (\Delta V_{z5} - \Delta V_z \text{ Bias}) (\text{S.F.}_z) / (\Delta T) (\text{local g})$$

and:

$$\Delta V_x \text{ Bias} = (\text{X PIPA Bias}) (\Delta T) / \text{S.F.}_x$$

$$\Delta V_z \text{ Bias} = (\text{Z PIPA Bias}) (\Delta T) / \text{S.F.}_z$$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.2.16.22.1.3 Perform the following calculations for Position 6.

$G'_6 = (G_6/\text{Cos}\ \theta y_6)$

where:

G_6 = Measured acceleration term (line j)

G'_6 = Corrected acceleration term

$\text{Cos}\ \theta y_6 = 1 - (\theta^2 y_6/2)$ for small angles

$\theta y_6 = \sqrt{\theta^2_{x6} + \theta^2_{z6}}$

and:

$\theta_{z6} = (\Delta V_{x6} - \Delta V_x\ \text{Bias})\ (\text{S.F.}_x)\ /\ (\Delta T)\ (\text{local g})$

$\theta_{x6} = (\Delta V_{z6} - \Delta V_z\ \text{Bias})\ (\text{S.F.}_z)\ /\ (\Delta T)\ (\text{local g})$

and:

$\Delta V_x\ \text{Bias} = (\text{X PIPA Bias})\ (\Delta T)/\text{S.F.}_x$

$\Delta V_z\ \text{Bias} = (\text{Z PIPA Bias})\ (\Delta T)/\text{S.F.}_z$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.2.16.22.2 Obtain data from last IRIG and/or PIPA Test and fill in Data Sheet x_{1-1}.

6.2.16.22.3 Obtain data from second last IRIG and/or PIPA Test and fill in Data Sheet x_{1-2}.

6.2.16.22.4 Obtain data from third last IRIG and/or PIPA Test and fill in Data Sheet x_{1-3}.

6.2.16.22.5 Perform the following calculations for each item appearing on Data Sheet x_i.

NOTE: See Paragraph 5.5 before continuing.

$$D_1 = \left| x_{i-1} - x_i \right|$$

$$D_2 = \left| x_{i-1} - x_i \right| + \left| x_{i-2} - x_{i-1} \right|$$

$$D_3 = \left| x_{i-3} - x_{i-2} \right| + \left| x_{i-2} - x_{i-1} \right| + \left| x_{i-1} - x_i \right|$$

DATA SHEET

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.2.16. 7.4.3	+N BDY - ADOAY Position +00001	meru/g	( )___·__	a
6.2.16. 8.4.3	+N BDZ - ADOAZ Position +00002	meru/g	( )___·__	b
6.2.16. 8.5.2	-X PIPA Test Position +00002	cm/sec^2	( ) 0 0___· ( )_____	c
6.2.16. 8.6.2	-N BDX + ADIAX Position +00002	meru/g	( )___·__	d
6.2.16. 9.4.3	+N BDX - ADOAX Position +00003	meru/g	( )___·__	e
6.2.16. 10.4.3	+N BDY + ADSRAY Position +00004	meru/g	( )___·__	f
6.2.16. 10.5.2	-Z PIPA Test Position +00004	cm/sec^2	( ) 0 0___· ( )_____	g
6.2.16. 10.6.2	+N BDZ + ADIAZ Position +00004	meru/g	( )___·__	h
6.2.16 11.4.3	+Y PIPA Test Position +00005	cm/sec^2	( ) 0 0___· ( )_____	i

DATA SHEET (continued)

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.2.16. 12.4.3	-Y PIPA Test Position +00006	cm/sec^2	( ) 0 0 ___ . ( ) _____	j
6.2.16 13.4.3	-NBDX + .707 (ADSRAX - ADOAX) Position +00007	meru/g	( ) ___ . __	k
6.2.16. 14.4.3	-.707 (NBDZ+NBDY) +0.5 (ADIAZ-ADIAY) +0.5 (ADSRAY + ADSRAZ) Position +00008	meru/g	( ) ___ . __	l
6.2.16. 15.4.3	-NBDZ + .707 (ADSRAZ-ADOAZ) Position +00009	meru/g	( ) ___ . __	m
6.2.16 16.4.3	.707 (NBDY-NBDX) +0.5 (ADIAY-ADIAX) +0.5 (ADSRAX) + 0.5 (ADOAY) Position +00010	meru/g	( ) ___ . __	n
6.2.16 17.4.3	-NDBX - ADOAX Position +00011	meru/g	( ) ___ . __	o
6.2.16. 17.5.2	+Z PIPA Test Position +00011	cm/sec^2	( ) 0 0 ___ . ( ) _____	p
6.2.16. 18.4.3	+NBDY + ADOAY Position +00012	meru/g	( ) ___ . __	q
6.2.16. 18.5.2	+X PIPA Test Position +00012	cm/sec^2	( ) 0 0 ___ . ( ) _____	r
6.2.16. 19.4.3	+NBDZ + ADOAZ Position +00013	meru/g	( ) ___ . __	s

DATA SHEET

CALCULATION	PARAMETER	UNITS	
$\frac{\text{line a + line q}}{2} = (\quad)\_\,\_\,\_\,.\,\_\,\_$ $\frac{\text{NBDY - ADOAY + NBDY + ADOAY}}{2}$ Transfer result to line ao	NBDY	meru	t
$\frac{\text{line q - line a}}{2} = (\quad)\_\,\_\,\_\,.\,\_\,\_$ $\frac{\text{NBDY + ADOAY - (NBDY - ADOAY)}}{2}$	ADOAY	meru/g	u
$\frac{\text{line b + line s}}{2} = (\quad)\_\,\_\,\_\,.\,\_\,\_$ $\frac{\text{NBDZ - ADOAZ + NBDZ + ADOAZ}}{2}$ Transfer result to line ap	NBDZ	meru	v
$\frac{\text{line s - line b}}{2} = (\quad)\_\,\_\,\_\,.\,\_\,\_$ $\frac{\text{NBDZ + ADOAZ - (NBDZ - ADOAZ)}}{2}$	ADOAZ	meru/g	w
$\frac{\text{line e - line o}}{2} = (\quad)\_\,\_\,\_\,.\,\_\,\_$ $\frac{\text{NBDX - ADOAX - (-NBDX - ADOAX)}}{2}$ Transfer result to line aq	NBDX	meru	x
$\frac{\text{line e + line o}}{2}\ \text{x}\ (-1) = (\quad)\_\,\_\,\_\,.\,\_\,\_$ $\frac{\text{NBDX - ADOAX - NBDX - ADOAX}}{2}\ \text{x}\ (-1)$	ADOAX	meru/g	y

DATA SHEET (continued)

CALCULATION	PARAMETER	UNITS	
line d + line x = ( ) ___ . __ (-NBDX + ADIAX) + NBDX Transfer result to line au	ADIAX	meru/g	z
line f - line t = ( ) ___ . __ (+NBDY + ADSRAY) - NBDY Transfer result to line ar	ADSRAY	meru/g	aa
line h - line v = ( ) ___ . __ (+NBDZ + ADIAZ) - NBDZ Transfer result to line av	ADIAZ	meru/g	ab
[line k + line x + .707 line y] x 1.414 [-NBDX + .707 ADSRAX - .707 ADOAX + NBDX + .707 ADOAX] x 1.414 Transfer results to line at	ADSRAX	meru/g	ac
(line m + line v + line w) x 1.414 [-NBDZ + .707(ADSRAZ-ADOAZ) + NBDZ + .707 ADOAZ] x 1.414 Transfer results to line as	ADSRAZ	meru/g	ad
(line n - .707 line t + .707 line x + 0.5 line z - 0.5 line ac - 0.5 line u) x 2 [.707(NBDY-NBDX) + 0.5(ADIAY-ADIAX) +0.5 ADSRAX + 0.5 ADOAY -.707 NBDY + .707 NBDX + 0.5 ADIAX -0.5 ADSRAX - 0.5 ADOAY] x 2 Transfer results to line aw.	ADIAY	meru/g	ae
line r - line c = ( )	PIPA X2G	cm/sec^2	af
line i - line j = ( )	PIPA Y2G	cm/sec^2	ag
line p - line g = ( )	PIPA Z2G	cm/sec^2	ah

DATA SHEET (continued)

CALCULATION	PARAMETER	UNITS	
1958.48 — line af x 1 cm/sec pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ax.	X PIPA S. F.	cm/sec/ pulse	ai
1958.48 — line ag x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ay.	Y PIPA S. F.	cm/sec/ pulse	aj
1958.48 — line ah x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer to line az.	Z PIPA S. F.	cm/sec pulse	ak
1/2 (line r + line c) = ( )__.___ Transfer results to line ba.	X PIPA Bias	cm/sec^2	al
1/2 (line i + line j) = ( )__.___ Transfer results to line bb.	Y PIPA Bias	cm/sec^2	am
1/2 (line p + line g) = ( )__.___ Transfer results to line bc.	Z PIPA Bias	cm/sec^2	an

DATA SHEET (x_1)

PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
NBDY	meru	-15		+15			ao
NBDZ	meru	-15		+15			ap
NBDX	meru	-15		+15			aq
ADSRAY	meru/g	-40		+40			ar
ADSRAZ	meru/g	-40		+40			as
ADSRAX	meru/g	-40		+40			at
ADIAX	meru/g	-100		+100			au
ADIAZ	meru/g	-100		+100			av
ADIAY	meru/g	-100		+100			aw
X PIPA S.F.error from line ai	PPM	-1900		+1900			ax
Y PIPA S.F.error from line aj	PPM	-1900		+1900			ay
Z PIPA S.F.error from line ak	PPM	-1900		+1900			az
X PIPA Bias from line al	cm/sec^2	-3.1		+3.1			ba
Y PIPA Bias from line am	cm/sec^2	-3.1		+3.1			bb
Z PIPA Bias from line an	cm/sec^2	-3.1		+3.1			bc

DATA SHEET

PARAMETER	UNITS	D_1	MAX	D_2	MAX	D_3	MAX
NBDY	meru		6.0		9.0		11.0
NBDZ	meru		6.0		9.0		11.0
NBDX	meru		6.0		9.0		11.0
ADSRAY	meru/g		14.0		21.0		25.0
ADSRAZ	meru/g		14.0		21.0		25.0
ADSRAX	meru/g		14.0		21.0		25.0
ADIAX	meru/g		17.0		33.0		40.0
ADIAZ	meru/g		17.0		33.0		40.0
ADIAY	meru/g		17.0		33.0		40.0
X PIPA S.F. error	PPM		400		500		600
Y PIPA S.F. error	PPM		400		500		600
Z PIPA S.F. error	PPM		400		500		600
X PIPA Bias	cm/sec^2		0.50		0.70		0.90
Y PIPA Bias	cm/sec^2		0.50		0.70		0.90
Z PIPA Bias	cm/sec^2		0.50		0.70		0.90

DATA SHEET (x_{1-1})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET (x_1-2)

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET (x_{1-3})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

6.2.17 **SXT-NB-IMU Fine Align Test** (see Table III, Section 5)

6.2.18 **Gyro Compassing Test**

6.2.18.1 Set the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify that +28 vdc OPTICS OPERATE BUS (CG 1530) is +28.0±3.0 vdc. Verify that the OPTX 28V 800 cps 1% 0° (CG 1211) and OPTX 28V 800 cps 5% -90° (CG 1212) are not flashing in the CRT.

6.2.18.2 Enter the following into the CMC:

VERB 37 ENTER 01 ENTER

6.2.18.3 When PROG display changes to 02, record time as T_0.

6.2.18.4 Gyro Compassing Accuracy

6.2.18.4.1 Wait 120 minutes from T_0. Record Inner, Middle and Outer Gimbal CDU readings every 5 minutes for the next 2 hours.

6.2.18.4.2 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO.

6.2.18.4.3 Enter VERB 65, ENTER into DSKY. Observe the PROG display on the DSKY change to 03.

6.2.18.4.4 When VERB 06 NOUN 41 flashes on the DSKY, insure R1 and R2 display Target 1 azimuth and elevation.

a. R1 = +XXX.XX (Target 1 azimuth)
b. R2 = +XX.XXX (Target 1 elevation)
c. R3 = 00001

6.2.18.4.5 Verify the data appearing in R1 and R2 and if correct, proceed. If not correct, perform the following sequence:

a. VERB 24, ENTER
b. +XXX.XX, ENTER (Target 1 azimuth)
c. ±XX.XXX, ENTER (Target 1 elevation)

6.2.18.4.6 After the correct readings for R1 and R2 are verified, enter VERB 33, ENTER into the DSKY.

6.2.18.4.7 When VERB 06 NOUN 41 flashes on the DSKY, insure that R1 and R2 display Target 2 azimuth and elevation.

a. R1 = XXX.XX (Target 2 azimuth)
b. R2 = XX.XXX (Target 2 elevation)
c. R3 = 00002.

6.2.18.4.8 Verify the data appearing in R1 and R2 and if correct, perform the following sequence:

a. VERB 24, ENTER
b. +XXX.XX, ENTER (Target 2 azimuth)
c. ±XX.XXX, ENTER (Target 2 elevation)

6.2.18.4.9 After the correct readings for R1 and R2 are verified, enter VERB 33, ENTER into the DSKY.

6.2.18.4.10 Set the OPTICS ZERO switch to OFF. Enter VERB 33 ENTER into the DSKY.

6.2.18.4.11 When the DSKY displays V51 flashing and R1 = 00001 set the OPTICS MODE switch on the G&N Indicator Control Panel to CMC. The CMC will align the SXT star LOS to the Target 1 position. When the alignment is complete as observed by no further movement of the Telescope Panel Angle Counters (TPAC) set the OPTICS MODE switch to MANUAL.

6.2.18.4.12 Using the OPTICS Hand Controller and a convenient CONTROLLER SPEED, align the SXT StLOS with Target 1 and press the MARK pushbutton. In approximately 30 seconds VERB 50 NOUN 25 shall flash with R1 = 00016. If satisfied that the MARK was good press the PRO pushbutton. If not satisfied with MARK, press the MARK REJECT pushbutton and repeat this step.

6.2.18.4.13 When the DSKY displays VERB 51 flashing and R1 = 00002 set the OPTICS MODE switch to CMC. The CMC will align the SXT to the Target 2 position. When alignment is complete as observed by no further movement of the TPAC, set the OPTICS MODE switch to MANUAL.

6.2.18.4.14 Using the OPTICS Hand Controller and a convenient CONTROLLER SPEED, align the SXT StLOS with Target 2 and press the MARK pushbutton. In approximately 30 seconds VERB 50 NOUN 25 shall flash and R1 = 00016. If satisfied that the MARK was good press the PRO pushbutton. If not satisfied with the MARK press the MARK REJECT pushbutton and repeat this step.

6.2.18.4.15 On the DSKY, observe the following data displayed:

VERB 06 NOUN 93
R1 = ±XX.XXX (X gyro elevation error, deg)
R2 = ±XX.XXX (Y gyro elevation error, deg)
R3 = ±XX.XXX (Z gyro azimuth error, deg)

Record R1, R2 and R3. The X and Y gyro elevation error shall be 0.00±0.55 degrees and the Z gyro azimuth error shall be 0.00±0.3 degrees. Enter VERB 34 ENTR into the DSKY. Observe PROG display on DSKY change to 02.

6.2.18.4.16 Immediately repeat steps 6.2.18.4.2 through 6.2.18.4.15 twice.

6.2.18.4.17 Repeat steps 6.2.18.4.1 through 6.2.18.4.15 at 150, 180 and 210 minutes from T_0.

6.2.18.4.18 Enter VERB 36 ENTR into the DSKY.

6.2.18.4.19 Enter the following into the DSKY:

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

Set the G&N POWER OPTICS switch on the LEB Lighting Control Panel to OFF.

6.2.18.5 Gyro Compassing Stability

6.2.18.5.1 Calculate the average of the first three X and Y gyro elevation errors and the first three Z gyro azimuth errors.

6.2.18.5.2 The last three X and Y gyro elevation errors shall not deviate from the baseline X and Y gyro elevation errors determined above by more than ±0.15 degrees.

6.2.18.5.3 The last three Z gyro azimuth errors shall not deviate from the baseline Z gyro azimuth error determined above by more than ±0.06 degrees.

6.2.19 CMC Voltage Margin Test

6.2.19.1 Verify that the G&N IMU HTR MNA and MNB circuit breaders are engaged. Computer MNA and MNB breakers are engaged, IMU MNA and MNB circuit breakers are not engaged, and the G&N Power-IMU switch on the LEB Lighting Control Panel is in the OFF position.

6.2.19.2 On the PSA Adapter Module (PSAAM), set the INHIBIT VOLTAGE FAIL switch to ON.

6.2.19.3 Rotate the LEB LTS NUMERICS SEL to approximately center position. Decrease the lighting to an absolute discernible minimum.

NOTE: This condition should not be altered throughout the test.

6.2.19.4 On K-148 enter the following:

VERB 36 ENTR

6.2.19.5 Into R-154 insert 0001. Verify and execute.

6.2.19.5.1 Into R-153 insert 1100. Verify and execute.

CAUTION: During the performance of this test, the +4 VDC CMC Power Supply shall not be operated at less than +2.5 vdc or greater than +5.2 vdc (CG 1030). The +14 VDC CMC Power Supply shall not be operated at less than +8.5 vdc or greater than +17.0 vdc (CG 1020).

NOTE: The flashing indication of the CMC Power Supplies on the CRT may be disregarded for this test.

6.2.19.6 Fail Voltage Detector Test

6.2.19.7 On K-148 enter the following sequence:

VERB 21 NOUN 27 ENTR
00010 ENTR

6.2.19.8 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to OFF.

6.2.19.9 Into C-156 insert +000001244. Execute and verify.

6.2.19.9.1 Into R-154 insert 0101. Execute and verify.

6.2.19.9.2 Into C-156 insert +XX.X001244. (The value XX.X shall be slowly increased until a CMC Voltage Fail occurs.) Execute and verify.

6.2.19.10 On the DSKY, verify the RESTART lamp is lit.

6.2.19.10.1 On the G&N panel verify the CMC Warning light is on and the MASTER ALARM light is on.

6.2.19.10.2 Press the MASTER ALARM pushbutton to reset.

6.2.19.11 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to the ON position.

6.2.19.12 On the CRT, verify the +14 VDC CMC supply (CG 1020) is between 15.6 and 16.4 vdc. Record.

6.2.19.12.1 Record the final C-START setting.

6.2.19.13 Into R-154 insert 0001. Execute and verify.

6.2.19.14 On K-148 enter the following:

VERB 36	ENTR
press	RSET (Reset)

6.2.19.15 On K-148 enter the following:

VERB 21	NOUN 27	ENTR
00010		ENTR

6.2.19.16 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to OFF.

6.2.19.17 Into C-156 insert -000001244. Execute and verify.

6.2.19.17.1 Into R-154 insert 0101. Execute and verify.

6.2.19.17.2 Into C-156 insert -XX.X001244. (The value XX.X shall be increased, negatively, until a CMC Voltage Fail occurs.) Execute and verify.

6.2.19.18 On the DSKY, verify the RESTART lamp is lit.

6.2.19.18.1 On the G&N panel verify the CMC Warning light is on and the MASTER ALARM light is on.

6.2.19.18.2 Press the MASTER ALARM pushbutton to reset.

6.2.19.19 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to ON.

6.2.19.20 On the CRT, verify the +14 VDC CMC supply (CG 1020) is between 12.1 and 12.8 vdc. Record.

6.2.19.20.1 Record the final C-START setting.

6.2.19.21 Into R-154 insert 0001. Execute and verify.

6.2.19.22 On K-148 enter the following:

VERB 36 ENTR
press RSET (Reset)

6.2.19.23 Into C-156 insert +000001244. Execute and verify.

6.2.19.24 On K-148 enter the following:

VERB 21 NOUN 27 ENTR
00010 ENTR

6.2.19.25 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to OFF.

6.2.19.26 Into C-156 insert +000001234. Execute and verify.

6.2.19.26.1 Into R-154 insert 0011. Execute and verify.

6.2.19.26.2 Into C-156 insert +XX.X001234. (The value XX.X shall be slowly increased until a CMC Voltage Fail occurs.) Execute and verify.

6.2.19.27 On the DSKY, verify the RESTART lamp is lit.

6.2.19.27.1 On the G&N panel verify the CMC Warning light is lit and the MASTER ALARM light is on.

6.2.19.27.2 Press the MASTER ALARM pushbutton to reset.

6.2.19.28 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to the ON position.

6.2.19.29 On the CRT verify the +4 VDC CMC Supply (CG 1030) is between 4.2 and 4.7 vdc. Record.

6.2.19.30 Record the final C-START setting.

6.2.19.31 Into R-154 insert 0001. Execute and verify.

6.2.19.32 On K-148 enter the following:

VERB 36 ENTR
press RSET (Reset)

6.2.19.33 On K-148 enter the following:

VERB 21 NOUN 27 ENTR
00010 ENTR

6.2.19.34 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to OFF.

6.2.19.35 Into C-156 insert -000001234. Execute and verify.

6.2.19.35.1 Into R-154 insert 0011. Execute and verify.

6.2.19.35.2 Into C-156 insert -XX.X001234. (The value XX.X shall be increased, negatively, until a CMC Voltage Fail occurs.) Execute and verify.

6.2.19.36 On the DSKY, verify the RESTART lamp is lit.

6.2.19.36.1 On the G&N panel verify the CMC Warning light is on and the MASTER ALARM light is on.

6.2.19.36.2 Press the MASTER ALARM pushbutton to reset.

6.2.19.37 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to ON.

6.2.19.38 On the CRT verify the +4 VDC CMC supply (CG 1030) is between 3.8 and 3.4 vdc. Record.

6.2.19.39 Record the final C-START setting.

6.2.19.40 Into R-154 insert 0001. Execute and verify.

6.2.19.41 On K-148 enter the following:

VERB 36 ENTR
press RSET (Reset)

6.2.19.42 Into C-156 insert +000001234. Execute and verify.

6.2.19.43 Voltage Margin Test

6.2.19.44 Verify the appropriate K-START tape for CSM Self-Check Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.19.44.1 Start the tape reader.

6.2.19.45 When the tape reader stops, verify:

R1 = +YYYYY (The value of YYYYY is Flight Rope dependent and is found in Appendix II.)
R2 = +10538 (Tape Number)
R3 = -YYYZX (X is the tape revision number, YYY is the spacecraft number when assigned, and Z is the revision to the rope revision number and has meaning for tapes in Section B of Appendix II).

6.2.19.45.1 Start the tape reader.

6.2.19.46 When the tape reader stops, verify:

R1 = 00101

6.2.19.47 Initiate Self-Check.

6.2.19.47.1 Start the tape reader.

6.2.19.48 When the tape reader stops, record the time. Wait until R2 increments twice.

6.2.19.49 Into R-154 insert 0111. Execute and verify.

6.2.19.50 Into C-156 insert +000001244. Execute and verify.

6.2.19.50.1 Repeatedly insert into C-156 +XX.X001244. (The value XX.X shall be slowly increased until the +14 VDC CMC supply has a value of +16.4 (+0.1, -0.0) vdc.) Execute and verify.

6.2.19.51 Into C-156 insert +000001234. Execute and verify.

6.2.19.51.1 Repeatedly insert into C-156, +XX.X001234. (The value XX.X shall be slowly increased until the +4 VDC CMC supply has a value of +4.5 (+0.1, -0.0) vdc.) Execute and verify.

6.2.19.52 Wait until the R2 display increments twice.

6.2.19.53 Into C-156 insert -000001244. Execute and verify.

6.2.19.53.1 Repeatedly insert into C-156, -XX.X001244. (The value XX.X shall be slowly increased, negatively, until the +14 VDC CMC supply has a value of 12.1 (+0.1, -0.0) vdc.) Execute and verify.

6.2.19.54 Wait until the R2 display increments twice.

6.2.19.55 Into C-156 insert -000001234. Execute and verify.

6.2.19.55.1 Repeatedly insert into C-156, -XX.X001234. (The value XX.X shall be slowly increased, negatively, until +4 VDC CMC supply has a value of 3.4 (+0.1, -0.0) vdc.) Execute and verify.

6.2.19.56 Wait until the R2 display increments twice.

6.2.19.57 Into C-156 insert +000001244. Execute and verify.

6.2.19.57.1 Repeatedly insert into C-156, +XX.X001244. (The value XX.X shall be slowly increased until the +14 VDC CMC supply has a value of +16.4 (+0.1, -0.0) vdc.) Execute and verify.

6.2.19.58 Wait until the R2 display increments twice.

6.2.19.59 Into C-156; insert +000001244. Execute and verify.

6.2.19.60 Into C-156, insert +000001234. Execute and verify.

6.2.19.61 On K-148 enter the following:

VERB 36 ENTR

6.2.19.62 Into R-154, insert 0000. Execute and verify.

6.2.19.63 Into R-153, insert 0000. Execute and verify.

6.2.19.64 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to OFF

APPENDIX I

Signal	Link	Nomenclature	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
CG 1020	1	+14 VDC CMC SUPPLY	+14.0±0.4 VDC	0%
CG 1021	1	+14V CMC SUPPLY NOISE RMS	0.2 VRMS MAX	0%
CG 1030	1	+4 VDC CMC SUPPLY	+4.00±0.2 VDC	0%
CG 1031	1	+4V CMC SUPPLY NOISE RMS	0.2 VRMS MAX	0%
CG 1040	2	+120 VDC PIPA SUPPLY	+120±6.0 VDC	1%
CG 1042	1	+120 VDC PIPA SUP NOISE RMS	1.5 VRMS MAX	0%
CG 1051	1	+20 VDC PIPA SUPPLY	+20.0±1.2 VDC	0%
CG 1052	1	-20 VDC PIPA SUPPLY	-20±2 VDC	0%
CG 1053	1	+20 VDC PIPA SUP NOISE RMS	1.0 VRMS MAX	0%
CG 1070	1	+4 VDC CDU SUPPLY	+4.0±0.2 VDC	0%
CG 1071	1	+4 VDC CDU SUP NOISE RMS	0.1 VRMS MAX	0%
CG 1100	1	-28 VDC SUPPLY	-27.5±6.0 VDC	0%
CG 1110	2	2.5 VDC TM BIAS	+2.50±0.06 VDC	0%
CG 1201	2	IMU 28V .8KC 1% 0° RMS	28.00±0.56VRMS	1%
CG 1202	1	IMU 28V .8KC 5% - 90° RMS	28.0±1.4 VRMS	0.33%
CG 1203	1	IMU 28V .8KC 5% 0° RMS	28.0±2.1 VRMS	0.33%
CG 1207	1	PH DIFF IMU 5% 0°, -90°	-90±10°	2.3%
CG 1211	1	OPTX 28V .8KC 1% 0° RMS	28.00±0.56 VRMS	0.33%
CG 1212	1	OPTX 28V .8KC 5% - 90° RMS	28.00±1.48 VRMS	0.33%
CG 1220	1	PH DIFF OPTX 1% IMU 1%	0° ±10°	2.3%
CG 1331	2	3.2 KC 28V SUPPLY	28.6±0.56 VRMS	1%
CG 1336	1	PH DIFF 3.2 KC 28V/CMC SYNC	0° ±10°	2.3%
CG 1500	1	+28 VDC IMU OPERATE BUS	28.8±3 VDC	0%
CG 1501	1	+28V IMU OPERATE BUS NOISE RMS	1.0 VRMS MAX	0%
CG 1510	1	+28 VDC IMU STANDBY BUS	28.8±3 VDC	0%
CG 1511	1	+28V IMU STANDBY BUS NOISE RMS	1.0 VRMS MAX	0%
CG 1520	1	+28 VDC CMC OPERATE BUS	28.8±3 VDC	0%
CG 1521	1	+28V CMC OPERATE BUS NOISE RMS	2.0 VRMS MAX	0%
CG 1530	1	+28 VDC OPTX OPERATE BUS	28.8±3 VDC	0%
CG 1531	1	+28V OPTX OPERATE BUS NOISE RMS	2.0 VRMS MAX	0%
CG 2001	2	X PIPA SG O/P	5 VRMS max	3%
CG 2021	2	Y PIPA SG O/P	5 VRMS max	0.3%
CG 2041	2	Z PIPA SG O/P	5 VRMS max	3%
CG 2108	1	IG SERVO ERROR QUAD	0.0±1.2 VRMS	3.6%
CG 2112	2	IG 1X RESOLVER O/P SIN	18.38±1.84 VRMS @ 45°	2.5%
CG 2113	2	IG 1X RESOLVER O/P COS	18.38±1.84 VRMS @ 45°	2.5%
CG 2117	2	IG SERVO ERROR IN PHASE	0.0±60 mv RMS @ null	1.4%
CG 2120	1	IG TORQUE MOTOR CURRENT	0.125 amp max during Fine Alignment Torquing	0%

PSAAM OUTPUT is the source of Link 1 signals. SCA OUTPUT is the source of Link 2 signals.

APPENDIX I (Continued)

Signal	Link	Nomenclature	G&N Test Requirements	PSAAM and/or SCA Uncertainty % of Full Scale
CG 2138	1	MG SERVO ERROR QUAD	0.0±1.2 VRMS	3.6%
CG 2142	2	MG 1X RESOLVER O/P SIN	18.38±1.84 VRMS @ 45°	2.5%
CG 2143	2	MG 1X RESOLVER O/P COS	18.38±1.84 VRMS @ 45°	2.5%
CG 2147	2	MG SERVO ERROR IN PHASE	0.0±60 mv rms @ null	1.4%
CG 2150	1	MG TORQUE MOTOR CURRENT	0.125 amp max during Fine Align Torquing	0%
CG 2168	1	OG SERVO ERROR QUAD	0.0±1.2 VRMS	3.6%
CG 2172	2	OG 1X RESOLVER O/P SIN	18.38±1.84 VRMS @ 45°	2.5%
CG 2173	2	OG 1X RESOLVER O/P COS	18.38±1.84 VRMS @ 45°	2.5%
CG 2177	2	OG SERVO ERROR IN PHASE	0.0±60 mv RMS @ null	1.4%
CG 2180	1	OG TORQUE MOTOR CURRENT	0.125 amp max during Fine Align Torquing	0%
CG 2219	1	PITCH ATT ERROR-CDU DAC O/P	5.06±0.5 VRMS @ 17°	0.67%
CG 2220	1	IG CDU FINE ERROR	0.0±0.07 VRMS @ null	0.29%
CG 2221	1	IG CDU COARSE ERROR	0.0±0.68 VRMS at null	0.29%
CG 2249	1	YAW ATT ERROR-CDU DAC O/P	5.06±0.5 VRMS at 17°	0.67%
CG 2250	1	MG CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 2251	1	MG CDU COARSE ERROR	0.0±0.68 VRMS at null	0.29%
CG 2279	1	ROLL ATT ERROR-CDU DAC O/P	5.06±0.5 VRMS at 17°	0.67%
CG 2280	1	OG CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 2281	1	OG CDU COARSE ERROR	0.0±0.68 VRMS	0.29%
CG 2300	2	PIPA TEMPERATURE	130.5±1.5° F Operate Mode	2%
CG 3011	1	TRUNNION CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 3021	1	SHAFT CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 3117	1	SXT SHAFT SERVO ERROR IN PH	-0.25 to -2.00 VRMS at Hi Rate	1.1%
CG 3118	1	SXT TRUNNION SERVO ERROR IN PH	-0.25 to -2.00 VRMS at Hi Rate	1.1%
CG 3140	1	SXT SHAFT TACH O/P	3.3±1.3 VRMS at Hi Rate	1.1%
CG 3145	1	SXT SHAFT MTR CONTROL WINDING	+0.5 to 4.00 VRMS at Med Rate	1.1%
CG 3150	1	SXT TRUNNION TACH O/P	3.3±1.3 VRMS at Hi Rate	1.1%
CG 3155	1	SXT TRUNNION MTR CONTROL WINDING	+0.25 to +2.00 VRMS at Med Rate	1.1%

APPENDIX I (Continued)

Signal	Link	Nomenclature	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
CG 3160	1	SCT SHAFT TACK O/P	3.3± 1.3 VRMS at Hi Rate	1.1%
CG 3170	1	SCT TRUNNION TACH O/P	0.85± 0.35 VRMS at Hi Rate	1.1%
CG 3721	2	SHAFT CDU DAC O/P	10.12± 1.00 VRMS at 17°	1%
CG 3722	2	TRUNNION CDU DAC O/P	10.12± 1.00 VRMS at 17°	1%
CG 4300	1	CMC TEMP	87.5±42.5°F	0.23%
CG 6020	1	PIPA CAL MODULE TEMP	72.5± 27.5°F	0.23%
CG 6021	1	IMU 800 cps 5% TEMP (PSA)	90 30°F	0%

See Page 5

APPENDIX II - SECTION A

K-START TAPE INFORMATION

NAME	NUMBER*	PROGRAM	R1=YYYYY R1 DISPLAY
CM Self-Check Test	F09C104-K10538-XX	COLOSSUS REV 249	09249
CM G/N OPCHK	F09C104-K10531-XX	↓	09249
CM Semi-Automatic Mode Test	F09C104-K10530-XX		09249
IRIG Scale Factor Test	F09C104-K00083-XX		09249
IMU Performance Test	F09C104-K00081-XX		09249
Alarms and Interrupts Test	F09C107-K10545-XX		09249
CM Self-Check Test	F11C106-K10538-XX	COLOSSUS II	11045
CM Self-Check Test	F11C107-K10538-XX	COLOSSUS IIA	11055
CM G/N OPCHK	F11C107-K10531-XX	(COMANCHE REV 55)	11055
CM Semi-Automatic Mode Test	F11C107-K10530-XX	↓	11055
IRIG Scale Factor Test	F11C107-K00083-XX		11055
IMU Performance Test	F11C107-K00081-XX		11055
Alarms and Interrupts Test	F11C107-K10545-XX		11055
CM Self-Check Test	F11C108-K10538-XX	COLOSSUS IIC	11067
CM G/N OPCHK	F11C108-K10531-XX	(COMANCHE REV 67)	11067
CM Semi-Automatic Mode Test	F11C108-K10530-XX	↓	11067
IRIG Scale Factor Test	F11C108-K00083-XX		11067
IMU Performance Test	F11C108-K00081-XX		11067
Alarms and Interrupts Test	F11C108-K10545-XX		11067

*NOTE: Where XX equals the tape revision number.

APPENDIX II - SECTION B

NEW TAPE NUMBER FORMAT

NAME	NUMBER	PROGRAM	R1	R3
CM Self-Check Test	F11C0720-K10538-X	Colossus IID	11072	-YYY0X
CM G/N OPCHK	F11C0720-K10531-X	(Comanche	11072	-YYY0X
CM Semi-Automatic Mode Test	F11C0720-K10530-X	Rev 72)	11072	-YYY0X
IRIG Scale Factor Test	F11C0720-K00083-X		11072	-YYY0X
IMU Performance Test	F11C0720-K00081-X		11072	-YYY0X
Alarms and Interrupts Test	F11C0720-K10545-X		11072	-YYY0X
Alms & Int Test/Rstrt Mon	F11C0720-K10550-X		11072	-YYY0X

NOTE: X is the tape revision number. YYY is the spacecraft number which is assigned to MIT Mission E-Memory Load Tapes only. The second digit from the right in the R3 display is the revision to the rope revision for which this tape is valid.

ADDENDUM I

SCOPE: The following changes are required to make ND1002379 applicable as G&N system technical support documentation for systems containing the Restart Monitor package as defined on drawing P/N 2898989.

Change 1: Add the following paragraphs after Paragraph 5.11.5:

5.11.6 If a CMC RESTART or CMC WARNING occurs, the following entries should be made on the DSKY or K-148:

```
VERB 01 NOUN 10 ENTR
00077           ENTR
```

Record DSKY Row 1

```
VERB 21 NOUN 10 ENTR
00077           ENTR
00000           ENTR
```

5.11.6.1 The contents of Row 1 should be interpreted as follows:

Alarm Source	Channel 77 Code (Octal)
** * Parity Fail (F Memory)	001
** * Parity Fail (E Memory	003
** TC Trap	004
** Rupt Lock	010
** Nightwatchman	020
*** Voltage Fail	040
Counter Fail	100
Scaler Fail	200
Scaler Double Frequency Alarm	400

* NOTE: Parity Fail will either be in E or F Memory, but not in combination.

** NOTE: There is a possibility that a Counter Fail Alarm will also occur, depending on when the alarm occurs, in which case Bit 7 will also be set.

*** NOTE: Other alarms will probably occur before the Voltage Fail Alarm occurs, in which case the contents of Channel 77 will contain the octal sum of all the alarms, but it will contain the Voltage Fail code.

Change 2: Add the following paragraph after Paragraph 6.2.1.3.8.1:

6.2.1.3.8.1.1 If a RESTART occurs in the step above, enter the following on K-148:

VERB 21 NOUN 10 ENTR
00077 ENTR
00000 ENTR

Change 3: Replace Paragraphs 6.2.2.6 through 6.2.2.9.5 with the following:

6.2.2.6 Alarms and Interrupts Test with Restart Monitor

6.2.2.6.1 Verify the appropriate K-START Tape for CM ALMS & INT TEST/RSTRT MON is on the K-START Tape Reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.2.6.2 Start the Tape Reader.

6.2.2.6.3 When the Tape Reader stops, press KEY RELEASE and verify:

R1 = +YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
R2 = +10550
R3 = -YYYZX (X is the tape revision number and Z is the revision number to the rope revision. Tapes listed in Section B of Appendix II will indicate the value of Z.)

6.2.2.6.4 Start the Tape Reader.

6.2.2.6.5 When the Tape Reader stops, verify:

R1 = 00100

6.2.2.7 Parity Fail Test and Rupt Lock Test

6.2.2.7.1 Parity Fail Test

6.2.2.7.1.1 Start the Tape Reader.

6.2.2.7.1.2 When the Tape Reader stops, verify the following:

(a) On the DSKY, the RESTART lamp is lit.
(b) The PGNCS Caution lamp is lit.
(c) R1 = 00001 or 00101.

6.2.2.7.1.3 On the DSKY, press the RSET pushbutton. Verify RESTART and PGNCS Caution lamps are not lit.

6.2.2.7.1.4 Start the Tape Reader.

6.2.2.7.1.4.1 When the Tape Reader stops, press KEY RELEASE and verify:

R1 = 00101

6.2.2.7.1.4.2 Start the Tape Reader.

6.2.2.7.1.5 When the Tape Reader stops, verify:

R1 = 00200

6.2.2.7.2 Rupt Lock Test

6.2.2.7.2.1 Start the Tape Reader.

6.2.2.7.2.2 When the Tape Reader stops, verify the following:

(a) On the DSKY, the RESTART lamp is lit.
(b) The PGNCS Caution lamp is lit.
(c) R1 = 00010 or 00110.

6.2.2.7.2.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNCS Caution lamps are not lit.

6.2.2.7.2.4 Start the Tape Reader.

6.2.2.7.2.5 When the Tape Reader stops, press KEY RELEASE and verify:

R1 = 00201.

6.2.2.7.2.6 Start the Tape Reader.

6.2.2.7.2.7 When the Tape Reader stops, verify:

R1 = 00300.

6.2.2.8 TC Trap Test

6.2.2.8.1 Start the Tape Reader.

6.2.2.8.2 When the Tape Reader stops, verify the following:

(a) On the DSKY, the RESTART lamp is lit.
(b) The PGNCS Caution lamp is lit.
(c) R1 = 00004 or 00104.

6.2.2.8.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNCS Caution lamps are not lit.

6.2.2.8.4 Start the Tape Reader.

6.2.2.8.5 When the Tape Reader stops, press KEY RELEASE and verify:

R1 = 00301

6.2.2.8.6 Start the Tape Reader.

6.2.2.8.7 When the Tape Reader stops, verify the following:

(a) On the DSKY, the RESTART lamp is lit.
(b) The PGNCS Caution lamp is lit.
(c) R1 = 00004 or 00104.

6.2.2.8.8 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNCS Caution lamps are not lit.

6.2.2.8.9 Start the Tape Reader.

6.2.2.8.10 When the Tape Reader stops, press KEY RELEASE and verify:

R1 = 00302

6.2.2.8.11 Start the Tape Reader.

6.2.2.8.12 When the Tape Reader stops, verify:

R1 = 00400

6.2.2.9 Nightwatchman Test

6.2.2.9.1 Start the Tape Reader.

6.2.2.9.2 When the Tape Reader stops, verify the following:

(a) The RESTART lamp on the DSKY is lit.
(b) The PGNCS Caution lamp is lit.
(c) R1 = 00020 or 00120.

6.2.2.9.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNCS Caution lamps are not lit.

6.2.2.9.4 Start the Tape Reader.

6.2.2.9.5 When the Tape Reader stops, press KEY RELEASE and verify:

R1 = 00401

Change 4: Add the following to Paragraph 6.2.19.10:

On K-148, enter the following sequence:

VERB 01 NOUN 10 ENTR
00077 ENTR

Verify the DSKY Row 1 display has Bit 6 ON. Other combinations of bits are permissible, but Bit 6 must be present.

Change 5: Revise Paragraph 6.2.19.11 as follows:

6.2.19.11 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to ON. On the DSKY, enter the following:

VERB 21 NOUN 10 ENTR
00077 ENTR
00000 ENTR

Change 6: Add the following to Paragraph 6.2.19.18:

On K-148, enter the following:

VERB 01 NOUN 10 ENTR
00077 ENTR

Verify the DSKY Row 1 display has Bit 6 ON. Other combinations of bits are permissible, but Bit 6 must be present.

Change 7: Revise Paragraph 6.2.19.19 as follows:

6.2.19.19 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to ON. On the DSKY, enter the following:

VERB 21 NOUN 10 ENTR
00077 ENTR
00000 ENTR

Change 8: Add the following to Paragraph 6.2.19.27:

On K-148, enter the following:

```
VERB 01 NOUN 10 ENTR
00077           ENTR
```

Verify the DSKY Row 1 display has Bit 6 ON. Other combinations of bits are permissible but Bit 6 must be present.

Change 9: Revise Paragraph 6.2.19.28 as follows:

6.2.19.28 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to ON. On the DSKY, enter the following:

```
VERB 21 NOUN 10 ENTR
00077           ENTR
00000           ENTR
```

Change 10: Add the following to Paragraph 6.2.19.36:

On K-148, enter the following:

```
VERB 01 NOUN 10 ENTR
00077           ENTR
```

Verify the DSKY Row 1 display has Bit 6 ON. Other combinations of bits are permissible, but Bit 6 must be present.

Change 11: Revise Paragraph 6.2.19.37 as follows:

6.2.19.37 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to ON. On the DSKY, enter the following:

```
VERB 21 NOUN 10 ENTR
00077           ENTR
00000           ENTR
```

APOLLO G&N Specification
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POST INSTALLATION CHECKOUT PROCESS SPECIFICATION FOR THE APOLLO GUIDANCE & NAVIGATION SYSTEM BLOCK II-KSC WITH COLOSSUS FLIGHT ROPES

Record of Revisions

Cm

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				AC	NASA
1/20/70	G	38001	2, 21, 22, 26-28, 42, 45, 54, 60-133	EA	MDH
			Was 133 pages, now ~~142~~ pages.		
4/2/70	H	38090	17-19, 141, 142	EA	MDH

This specification consists of page 1 to 142 inclusive.

APPROVALS	Not Required CCA497-0274 **NASA/MSC**	**MIT/IL**	CCB E. N. Austin 7/25/68	D. A. Ziemer **ACSP**	AEA

5.9.1.2 A record of the amount of time each of the four prime power busses are "on" shall be kept and forwarded to the next receiving agency.

5.10 Interface

5.10.1 The Apollo G&N System shall interface with accepted ECS and EPS distribution systems for power and environment control purposes and with the SCS or or SCS substitute system for signal interface in accordance with the applicable ICD's.

5.11 General System Operating Characteristics.

5.11.1 The program does not always automatically display computer error codes when a PROG alarm occurs. If error code is desired enter the following on K-148 and then observe the DSKY display.

VERB 05 NOUN 09 ENTR

R1 = FAILREG
R2 = FAILREG + 1
R3 = FAILREG +2

5.11.2 The DSKY "NO ATT" lamp illuminates any time the system is in the Coarse Align Mode, IMU Cage, or during turn on.

5.11.3 Tracker Fail lamp may light after optics power turn on. Press the RSET pushbutton to extinguish.

5.11.4 The CMC warning light may come on for approximately 20 seconds when +28 VDC CMC Operate Power is applied; if the MASTER ALARM light illuminates, push to reset.

5.11.5 When coming out of AGC STBY, if the Standby lamp does not extinguish when the PRO pushbutton is pressed, repeatedly press the PRO pushbutton until the Standby lamp does extinguish. Record the number of times it was necessary to press the PRO pushbutton. No more than three depressions of the PRO pushbutton shall be required to turn the STBY lamp off.

6.0 DETAIL REQUIREMENTS

6.1 Initial Test Conditions

6.1.1 The following precautions shall be observed to preclude loss of continuity in inertial component performance history of the IMU. Deviation may necessitate recalibration of the inertial components.

6.1.1.1 The IMU shall be supplied with heater power on a continuous basis. When S/C Ground Power Supply, Model No. C14-418 is not providing heater power, then the heater power shall be supplied through the Portable Temperature Controller (PTC) Model No. S23-011. The temperature of the IRIG's shall be maintained between 120° and 150°F. The temperature of the PIPA's shall be maintained between 115° and 145°F.

6.1.1.2 The Standby Mode is identified by the circuit breakers IMU HTR MN A, IMU HTR MN B, COMPUTER MN A and MN B in the ON position and the G&N Power-IMU switch on LEB Lighting Control Panel in the OFF position. The Operate Mode is identified by the circuit breaker IMU HTR MN A, MN B, COMPUTER MN A and MN B in the ON position and the G&N Power-IMU switch on the LEB Lighting Control Panel in the ON position. The G&N System shall be operating in the Standby Mode with CMC power ON for a minimum of two hours prior to advancing to the IMU Operate Mode. In the event Standby or CMC power is interrupted, an equivalent time period, but not less than 15 minutes, shall be allowed when power is restored before advancing to the Operate Mode, except that when the interval of interruption exceeds two hours, a two-hour warmup period shall be mandatory (exceptions to the 2-hour warmup are noted in 6.2.5.2).

6.1.1.3 The Inertial Measurement Unit shall not be without heater power for more than 15 minutes.

6.1.1.4 During the turn on of the G&N power, COMPUTER MN A and MN B and IMU HTR MN A and IMU HTR MN B circuit breakers must be turned on before the IMU MN A and IMU MN B circuit breakers on the Right Hand Circuit Breaker Panel of the CM. During the turn off of the G&N power the IMU MN A and IMU MN B circuit breakers must be turned off before the IMU HTR MN A and IMU HTR MN B circuit breakers on the Right Hand Circuit Breaker Panel of the CM. In no case shall COMPUTER MN A and MN B circuit breakers be turned off before IMU MN A and MN B circuit breakers or G/N POWER-IMU switch.

6.1.1.5 A warmup period of 1 hour with OPERATE power applied shall be required prior to performing any test in which gyro and accelerometer parameters are measured, and 15 minutes warmup prior to any test in which precision amplitude and frequency power supply checks are made.

6.1.1.6 The following Command Module switches shall be in the position shown unless specifically directed otherwise in a procedural function.

a. UP TLM switches on the LEB G&N Control Panel and MDC Panel 2 shall be set to ACCEPT.

b. LAUNCH VEHICLE - GUIDANCE switch on MDC Panel 2 shall be set to IU.

c. The SC CONT switch on MDC Panel 1 shall be set to CMC.

d. The CMC MODE switch on MDC Panel 1 shall be set to AUTO.

e. The ΔV CG switch on MDC Panel 1 shall be set to CSM.

f. The LIGHTS-INTEGRAL control on the LEB Lighting Control Panel and the Left Hand Circuit Breaker panel shall be set to the minimum brightness - OFF position.

6.1.2 The following optical reference alignment requirements shall be demonstrated - MSO only.

6.1.2.1 G&N Installation Qualification Fixture.

6.1.2.1.1 The SXT Optical Reference No. 1 (Azimuth Autoset) LOS shall be located approximately 40 degrees (CW when viewed from above) from the S/C Z axis measured in a horizontal plane. At this position, the Optical Reference shall be capable of being viewed through the SXT ST LOS.

6.1.2.1.2 The SXT Optical Reference LOS position with respect to the horizontal plane shall be known to within 5 arc-seconds. The azimuth bearing of the Optical Reference LOS shall be known to within ±30 minutes of arc.

6.1.2.1.3 The SXT Optical Reference No. 2 LOS shall be located approximately 80 degrees from the SXT Optical Reference No. 1 (40 degrees from S/C Z axis) measured in a horizontal plane. At this position, the Optical Reference shall be capable of being viewed through the SXT STAR LOS.

6.1.2.1.3.1 The SXT optical reference LOS position with respect to the horizontal plane shall be known to within 5 arc-seconds. The azimuth bearing of the Optical Reference LOS shall be known to within ±30 minutes of arc.

6.1.2.1.4 SXT Optical Reference No. 3 shall be capable of being viewed through the SXT LLOS and the STAR LOS simultaneously at the Zero Optics position.

6.1.2.1.4.1 SXT Optical Reference No. 3 shall have the capability to measure the non-parallelism of the LLOS and STAR LOS to a resolution of 2 arc-seconds.

6.2.2.9.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNCS Caution lamps are not lit.

6.2.2.9.4 Start the Tape Reader.

6.2.2.9.5 When the Tape Reader stops, press KEY RELEASE and verify:

R1 = 00401

Change 4: Revise Paragraph 6.2.19.11 to read as follows:

6.2.19.11 On PSAAM, set INHIBIT VOLTAGE FAIL switch ON. On K-148, enter the following:

```
VERB  01  NOUN  10    ENTR
00077                 ENTR
```

Verify DSKY Row 1 display has bit 6 on. Other combinations of bits are permissible, but bit 6 must be on.

Change 5: Revise Paragraph 6.2.19.14 to read as follows:

6.2.19.14 On K-148, enter the following:

```
VERB  21  NOUN  10    ENTR
00077                 ENTR
00000                 ENTR
VERB 36               ENTR
Press                 RSET
```

Change 6: Revise Paragraph 6.2.19.19 to read as follows:

6.2.19.19 On PSAAM, set INHIBIT VOLTAGE FAIL switch ON. On K-148, enter the following:

```
VERB  01  NOUN  10    ENTR
00077                 ENTR
```

Verify DSKY Row 1 display has bit 6 on. Other combinations of bits are permissible, but bit 6 must be on.

Change 7: Revise Paragraph 6.2.19.22 to read as follows:

6.2.19.22 On K-148, enter the following:

```
VERB  21  NOUN  10    ENTR
00077                 ENTR
00000                 ENTR
VERB 36               ENTR
Press                 RSET
```

Change 8: Revise Paragraph 6.2.19.28 to read as follows:

6.2.19.28 On PSAAM, set INHIBIT VOLTAGE FAIL switch ON. On K-148, enter the following:

VERB 01 NOUN 10	ENTR
00077	ENTR

Verify DSKY Row 1 display has bit 6 on. Other combinations of bits are permissible, but bit 6 must be on.

Change 9: Revise Paragraph 6.2.19.32 to read as follows:

6.2.19.32 On K-148, enter the following:

VERB 21 NOUN 10	ENTR
00077	ENTR
00000	ENTR
VERB 36	ENTR
Press	RSET

Change 10: Revise Paragraph 6.2.19.37 to read as follows:

6.2.19.37 On PSAAM, set INHIBIT VOLTAGE FAIL switch ON. On K-148, enter the following:

VERB 01 NOUN 10	ENTR
00077	ENTR

Verify DSKY Row 1 display has bit 6 on. Other combinations of bits are permissible, but bit 6 must be on..

Change 11: Revise Paragraph 6.2.19.41 to read as follows:

6.2.19.41 On K-148, enter the following:

VERB 21 NOUN 10	ENTR
00077	ENTR
00000	ENTR
VERB 36	ENTR
Press	RSET

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Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				AC	NASA
1/20/70	G	38001	2,21,22,26-28,42,45,54,60-133	EA	MDH
			Was 133 pages, now 142 pages.		
4/2/70	H	38090	17-19, 141, 142	EA	MDH
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			143 pages.		

This specification consists of page 1 to 143 inclusive.

APPROVALS	Not Required CCA497-0274 **NASA/MSC**	**MIT/IL**	CCB E. N. Austin 7/25/68	AEA D. A. Ziemer **ACSP**

6.2.3.1.13 1 hour after the application of IMU OPERATE power monitor and record PIPA TEMP (CG 2300) every 5 minutes for 30 minutes. Verify that each reading does not deviate from the average of each signal by more than 0.1°F.

6.2.3.1.14 When 2 hours have elapsed since the application of IMU OPERATE power record PIPA TEMP. PIPA TEMP shall be 130.5±1.5°F. PIPA TEMP shall be within 0.5°F of that recorded in 6.2.3.1.12 and 6.2.1.3.8.4.

6.2.3.2 Optics Power ON

6.2.3.2.1 Optics power shall be applied by actuating the G&N OPTICS MN A and OPTICS MN B breakers on the Right Hand Circuit Breaker Panel (breakers pushed in), and placing G/N Power - OPTICS switch on the LEB Lighting Control Panel to ON.

6.2.3.2.2 OPTICS +28 VDC discrete shall be issued (CG 1533). Verify by observing that the OPTICS lamp on Event Module is illuminated. Verify that the +28 VDC OPTX OPERATE BUS (CG 1530) is +28.8±3 VDC. Record the indication on the CRT.

6.2.3.2.3 Verify the following secondary power supply voltages on the CRT are not flashing:

CG 1211 OPTX 28V 800 CPS 1 pct 0 ph
CG 1212 OPTX 800 CPS 5 pct-90 ph

6.2.3.2.3.1 Set/verify OPTICS MODE on the G&N Indicator Control Panel to MAN.

6.2.3.2.3.2 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Indicator Panel to ZERO.

6.2.3.3 IMU Cage Test

6.2.3.3.1 Enter the following into the DSKY:

a. VERB 40 NOUN 20, ENTER (wait 3 seconds)
b. VERB 41 NOUN 20, ENTER
c. +00200, ENTER
d. +00200, ENTER
e. +00200, ENTER

Observe that the NO ATT lamps on the DSKY's light and that CDUX, CDUY, CDUZ on the CRT indicate approximately +00200.

6.2.3.3.2 Set up the Analog Recorder to monitor the following signals:

a. IG 1X Resolver Output Sine (CG 2112)
b. MG 1X Resolver Output Sine (CG 2142)
c. OG 1X Resolver Output Sine (CG 2172)

Start the Analog Recorders.

6.2.3.3.3 On MDC panel 1, press and hold the IMU CAGE switch in the CAGE position. On the Analog Recorder, verify that the 1X Sine signals (CG 2112, CG 2142, and CG 2172) null out at 0.5V rms or less.

6.2.3.3.4 Release the IMU CAGE switch. Disregard any momentary transients on the 1X Resolver Sine signals when the switch is released. Sustained oscillations shall be cause for immediate removal of IMU OPERATE power.

6.2.3.3.5 On the CRT verify that CDUX, CDUY and CDUZ are all between +35850 and +00150.

6.2.3.3.6 Stop the Analog Recorders.

6.2.4 G&N System Power Supplies Test

6.2.4.1 Proceed with this test if 6.2.3, Operate Power On Test, has been completed and system operation has not been interrupted. If system operation has been interrupted, perform 6.2.5.2, Turn On Procedure, before proceeding with this test. Insure that the IMU Operate Power has been on for at least 15 minutes before proceeding with this test.

6.2.4.2 Enter the following sequence into the K-Start. Verb 41 NOUN 20, ENTER; +00000 ENTER; +00000 ENTER; +00000 ENTER.

6.2.4.3 Set/Verify the following circuit breakers and switches on the Right Hand Circuit Breakers Panel and LEB.

a. COMPUTER MN A to ON (pushed in) and COMPUTER MN B to OFF (pulled out).
b. G/N - POWER to AC1
c. IMU HTR MN A to ON (pushed in) and IMU HTR MN B to OFF (pulled out).
d. IMU MN A to ON (pushed in) and IMU MN B to OFF (pulled out).
e. G/N POWER - IMU to IMU
f. OPTICS MN A to ON (pushed in) and OPTICS MN B to OFF (pulled out).
g. G/N POWER - OPTICS to OPTICS

6.2.4.4 Record the voltage indicated on the CRT for the following signals:

a. The +28 VDC IMU OPERATE (Bus No. 1) output voltage shall be +28.8±3 VDC (CG 1500).
b. The +28 VDC IMU STANDBY (Bus No. 2) output voltage shall be +28.8±3 VDC (CG 1510).
c. The +28 VDC CMC OPERATE (Bus No. 3) output voltage shall be +28.8±3 VDC (CG 1520).
d. The +28 VDC OPTX OPERATE (Bus No. 4) output voltage shall be +28.8±3 VDC (CG 1530).
e. The CG 2221, IGA CDU Coarse Error measurement shall be 0.0±0.68V rms.
f. The CG 2251 MGA CDU Coarse Error measurement shall be 0.0±0.68V rms.
g. The CG 2281 OGA CDU Coarse Error measurement shall be 0.0±0.68V rms.

6.2.4.5 Record the voltage indicated on the CRT for the following power supplies:

a. The +120 VDC PIPA Power Supply output voltage shall be 120±6 VDC (CG 1040).
b. The +20 VDC PIPA Power Supply output voltage shall be 20.0±1.2 VDC (CG 1051).
c. The -20 VDC PIPA Power Supply output voltage shall be -20±2 VDC (CG 1052).
d. The -28 VDC Electronics Power Supply output voltage shall be -27.5±6.0 VDC (CG 1100).

6.2.4.6 The following values shall be measured with the guidance reference clock synchronizing input pulse. Record the voltage indicated on the CRT.

a. IMU 28V, 800 CPS 1% 0 deg voltage shall be 28.0±0.6 VAC (CG 1201)
b. IMU 28V, 800 CPS 5% PHA - 90 deg. voltage shall be 28.0±1.4 VAC (CG1202).
c. IMU 28V, 800 CPS 5% PHB 0 deg. voltage shall be 28.0±2.1 VAC (CG 1203).
d. Optics 28V, 800 CPS 1% 0 deg voltage shall be 28.0±0.6 VAC (CG 1211).
e. Optics 28V, 800 CPS 5% - 90 deg voltage shall be 28.0±1.5 VAC (CG 1212).
f. PH Diff IMU 5% 0 deg. -90 deg. (CG 1207) phase difference shall be -90° ±10°.
g. PH Diff Optics 1% IMU 1% (CG 1220) phase difference shall be 0° ±10°.

6.2.4.7 Record the voltages indicated on the CRT for the following power supplies:

a. The +14 VDC CMC Power Supply output voltage shall be +14.0±0.4 VDC (CG 1020).
b. The +4 VDC CMC Power Supply output voltage shall be +4.0±0.2 VDC (CG 1030).
c. The +4 VDC CDU Power Supply output voltage shall be +4.0±0.2 VDC (CG 1070).
d. The +2.50 VDC TM BIAS SUPPLY output voltage shall be +2.50±0.06 VDC (CG 1110).

6.2.4.8 Record the CRT indications for the following measurements:

a. The 28V, 3200 CPS Power Supply feedback output voltage shall be 28.6±0.6V RMS (CG 1331).
b. The phase difference between the 3.2 Kc supply and CMC sync shall be 0° ±10° (CG 1336).
c. The +14 VDC CMC Power Supply rms noise shall be less than 0.2 vrms (CG 1021).
d. The +4 VDC CMC Power Supply rms noise shall be less than 0.2 vrms (CG 1031).

6.2.4.8.1 Enter the following into K-148:

```
VERB 41 NOUN 20 ENTR
+00000          ENTR
+00000          ENTR
+09000          ENTR
Wait 15 seconds.
```

6.2.4.9 Set/Verify the following circuit breakers and switches on the Right Hand Circuit Breaker Panel and LEB:

a. G/N POWER-OPTICS to OFF
b. OPTICS MN B to ON (pushed in) and OPTICS MN A to OFF (pulled out)
c. G/N POWER - IMU to OFF
d. IMU MN B to ON (pushed in) and IMU MN A to OFF (pulled out)
e. IMU HTR MN A to OFF (pulled out)
f. G/N - POWER to OFF
g. COMPUTER MN B to ON (pushed in) and COMPUTER MN A to OFF (pulled out)

6.2.4.10 Verify that the +28 VDC CMC OPERATE output voltage is +28.8±3 VDC (CG 1520).

6.2.4.11 Set the G/N - POWER switch on the LEB to AC2. Set the IMU HTR MN B to ON (pushed in). Verify that the +28 VDC IMU STANDBY output voltage is +28.8±3 VDC (CG 1500).

6.2.4.12 Wait until 15 minutes have elapsed since setting G/N POWER - IMU to OFF in 6.2.4.9.c then set the G/N POWER - IMU to IMU. Verify that the +28 VDC IMU OPERATE output voltage is +28.8±3 VDC (CG 1500).

6.2.4.13 Set the G/N POWER - OPTICS to OPTICS. Verify that the +28 VDC OPTX OPERATE output voltage is +28.8±3 VDC (CG 1530).

6.2.4.14 Repeat 6.2.4.5 through 6.2.4.8.

6.2.4.15 Set the following circuit breakers to the position indicated:

a. Set the COMPUTER MN A to ON (pushed in).
b. Set the IMU HTR MN A to ON (pushed in).
c. Set the IMU MN A to ON (pushed in).
d. Set the OPTICS MN A to ON (pushed in).

6.2.4.16 Miscellaneous Checks - The following miscellaneous signals are required to supply data for system evaluation in the event of failure, or for trend analysis of system performance. Record the values displayed on the CRT for the following signals.

a.	CG 4300	CMC Temperature
b.	CG 6020	PIPA Calibration Module Temperature
c.	CG 6021	IMU 800 CPS 5% Temperature

6.2.4.17 Verify and record the following signals displayed on the CRT:

a. +120 VDC PIPA SUP NOISE RMS shall be less than 1.5 VRMS (CG 1042).
b. +20 VDC PIPA SUP NOISE RMS shall be less than 1.0 VRMS (CG 1053)
c. +4 VDC CDU SUP NOISE RMS shall be less than 0.1 VRMS (CG 1071).
d. +28V IMU OPERATE BUS NOISE RMS shall be less than 1.0 VRMS (CG 1501)
e. +28V IMU STANDBY BUS NOISE RMS shall be less than 1.0 VRMS (CG 1511).
f. +28V CMC OPERATE BUS NOISE RMS shall be less than 2.0 VRMS (CG 1521)
g. +28V OPTX OPERATE BUS NOISE RMS shall be less than 2.0 VRMS (CG 1531).

6.2.4.18 The noise peaks of the following signals are demonstrated on the event light when the peaks have a rise time between 2 and 50 μsec and the peak voltage exceeds 5 volts.

6.2.4.18 (continued)	a.	+14V CMC SUPPLY NOISE PEAKS	(CG 1022)
	b.	+4V CMC SUPPLY NOISE PEAKS	(CG 1032)
	c.	+120 VDC PIPA SUPPLY NOISE PEAKS	(CG 1043)
	d.	+4 VDC CDU SUPPLY NOISE PEAKS	(CG 1072)
	e.	+28V IMU OPERATE BUS NOISE PEAKS	(CG 1502)
	f.	+28V IMU STANDBY BUS NOISE PEAKS	(CG 1512)
	g.	+28V CMC OPERATE NOISE PEAKS	(CG 1522)
	h.	+28V OPTX OPERATE NOISE PEAKS	(CG 1532)

6.2.4.19 If Optics Testing will not continue, set the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OFF.

6.2.5 General Turn Off and Turn On Procedure

NOTE: The procedure shall be utilized any time after performing 6.2.1, Standby Power On Test and 6.2.3, Operate Power On Test to turn on or turn off the G&N Systems. Appropriate portions of this procedure will be referenced in other tests.

6.2.5.1 Turn Off Procedure.

CAUTION: This procedure must be performed in the sequence specified, Failure to adhere to this sequence may require calibration of the inertial components.

6.2.5.1.1 Enter the following sequence into K-148:

a. VERB 41 NOUN 20, ENTER
b. +00000 ENTR
c. +00000 ENTR
d. +09000 ENTR

Verify that the GIMBAL LOCK indicator on the DSKY'S is illuminated. On the G&N Indicator Control Panel verify PGNS light is ON. On the DSKY verify NO ATT light is ON.

6.2.5.1.2 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the following switches on the G&N Indicator Control Panel to the positions designated.

a. OPTICS ZERO to ZERO
b. OPTICS MODE to MANUAL
c. OPTICS COUPLING to DIRECT
d. OPTICS SPEED to MED
e. OPTICS TEL TRUN to SLAVE to SXT
f. RETICLE BRIGHTNESS to minimum brightness position

6.2.5.1.3 Set the G/N Power - IMU switch on the LEB Lighting Control Panel to OFF and G&N IMU MN A and MN B circuit breakers on the Right Hand Circuit Breaker panel to OFF (breakers pulled out).
NOTE: If PROG ALARM 212 occurs, press RSET and continue.

6.2.5.1.3.1 On K-148 enter the following:

VERB 21 NOUN 01 ENTR
00034 ENTR
00000 ENTR
Verify GIMBAL LOCK lamp goes out.

6.2.5.1.3.1 (continued)

VERB 21 NOUN 01 ENTR
01036 ENTR
40000 ENTR

Verify that NO ATT indication is OFF.

6.2.5.1.4 Set the G&N Power AC1-OFF-AC2 Switch on the Right Hand Circuit breaker panel to OFF and the G&N POWER AC1 and AC2 circuit breakers to OFF (breakers pulled out).

6.2.5.1.5 Decrease the LIGHTS - NUMERICS controls on both the Left Hand Circuit Breaker panel and the LEB Lighting Control Panel to the minimum brightness - OFF position.

6.2.5.1.6 Set the PSAAM power switch on the PSAAM to OFF.

6.2.5.1.7 Set the IMU HTR MN A and MN B circuit breaker on the Right Hand Circuit Breaker panel to OFF (breakers pulled out).

6.2.5.1.8 Set the G/N POWER - OPTICS switch on the LEB Lighting Control Panel to OFF and G&N OPTICS MN A and MN B breakers on the Right Hand Circuit breaker panel to OFF.

6.2.5.1.9 Set the COMPUTER MN A and MN B Circuit breakers on the Right Hand Circuit Breaker panel to OFF (breakers pulled out).

6.2.5.1.10 Verify that the PTC is supplying inertial components heater power to the G&N System. This will be indicated by the following on the PTC.

a. G&N ON (PTC inhibit) light not illuminated.
b. IMU Temp/heater current meter indicates IMU temperature of 130° ±5°F.

6.2.5.2 Turn ON Procedure

6.2.5.2.1 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set or verify the following G&N Indicator Control Panel switches to the position indicated.

a. CONDITION LAMPS to ON
b. OPTICS ZERO to ZERO
c. OPTICS MODE to MANUAL
d. OPTICS COUPLING to DIRECT
e. OPTICS SPEED to LO
f. OPTICS TEL TRUN to SLAVE to SXT
g. RETICLE BRIGHTNESS to minimum brightness position.

6.2.5.2.2 Insure that interfacing system EPS and ECS are turned on and operating properly.

CAUTION: The remaining procedure must be followed in sequence specified. Failure to adhere to this sequence may require recalibration of the inertial components.

6.2.5.2.3 Energize the G&N COMPUTER MN A and MN B breakers on the Right Hand Circuit Breaker panel (breakers pushed in). Press the STBY pushbutton on the DSKY for approximately 3 seconds. Verify +14 and +4 VDC AGC power supply outputs on CRT display. Voltages shall be +14±0.4V (CG 1020) and +4±0.2 (CG1030). On DSKY verify TEMP light is ON.

6.2.5.2.4 Set the G&N POWER AC1 and AC2 breakers on the Right Hand Circuit Breaker Panel to ON (breakers pushed in). Set the G&N POWER AC1-OFF-AC2 switch to AC1.

6.2.5.2.4.1 Set the G&N DSKY and Display Panel brightness to the minimum acceptable level by manipulation of LIGHTS - NUMERICS control on both Left Hand Circuit breaker panel and LEB Lighting Control panel.

6.2.5.2.5 Energize the G&N IMU HTR, MN A and MN B breakers on the Right Hand Circuit Breaker panel (breakers pushed in). Insure that the CMC +28 VDC discrete lamp on the Event Module is illuminated (CG 1523). Verify TEMP light on DSKY is extinguished.

6.2.5.2.5.1 Set/Verify the following switches on the PSAAM.

a. PSAAM PWR to ON
b. INHIBIT VOLTAGE FAIL to OFF.

6.2.5.2.6 Enter VERB 36 ENTER into K148. Press ERROR RESET pushbutton on K148. All computer alarms on the Main Display Console (MDC) and LEB AGC DSKY shall clear. Verify that DSKY R1, R2, R3, VERB, NOUN and PROG indications are blank.

6.2.5.2.7 Verify the appropriate K-START tape for CM Self-Check Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.5.2.8 Start tape reader.

6.2.5.2.9 When tape reader stops, verify the following on the CRT DSKY display:

R1 = +YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
R2 = +10538 (Tape number)
R3 = -YYYZX (X is the tape revision number, YYY is the spacecraft number when assigned, and Z is the revision to the rope revision number and has meaning for tapes in Section B of Appendix II).

6.2.5.2.10 Start tape reader.

6.2.5.2.11 When tape reader stops, verify:

R1 = 00101

6.2.5.2.12 Start tape reader

6.2.5.2.13 Monitor DSKY until R2 (SCOUNT+1) increments twice. If an error is detected, the PROG alarm lamp on the DSKY shall light.

6.2.5.2.14 On K-148, enter the following to turn off Self-Check:

VERB 21 NOUN 27 ENTR
00000 ENTR
VERB 34 ENTR

6.2.5.2.15 NOTE: Allow 2 hours to elapse before proceeding, with the following exceptions:

a. If the G&N System has been in the power off state for less than 5 days with the gimbals in the following positions,

X = 000.00±005.00 deg
Y = 000.00±005.00 deg
Z = 090.00±005.00 deg

or has been in the power off state for less than 12 days with the gimbals in the following positions,

X = 000.00±001.00 deg
Y = 000.00±001.00 deg
Z = 090.00±001.00 deg

and the system has not been moved, allow 15 minutes to elapse before proceeding.

b. If the G&N System has been turned off with the gimbals in the unparked position for less than 2 hours allow a warmup time equal to the time off but not less than 15 minutes to elapse before proceeding.

CAUTION: If the requirements of 6.2.5.2.16 are not met, remove IMU Operate Power immediately by setting the G/N POWER-IMU switch on the LEB Lighting Control Panel to OFF.

After the required warmup time has elapsed set the G&N IMU MN A and MN B circuit breaker on the Right Hand circuit breaker panel to ON (breaker pushed in), and the G/N POWER-IMU switch on the LEB Lighting Control panel to the IMU position (toggle up).

6.2.5.2.16 Immediately begin monitoring the following measurements.

a. On the CRT verify that IMU Operate Power is +28.8±3 VDC (CG 1500).

b. On the meter modules verify that oscillations are not sustained and that a null is achieved within 10 seconds of power application on the following measurements:

CG 2112	IG 1X Resolver Output Sin
CG 2142	MG 1X Resolver Output Sin
CG 2172	OG 1X Resolver Output Sin

c. On the CRT verify the absence of the +120 VDC PIPA Supply (CG 1040) for a period of 90±10 seconds following power application. After approximately 100 seconds, the voltage shall read +120±6 VDC.

6.2.5.2.17 Verify that the PROG alarm lamp on the DSKY's does not light.

6.2.5.2.18 Enter VERB 40, NOUN 20, ENTER into K148. Wait 15 seconds.

6.2.5.2.19 On K-148 enter the following.

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.5.2.20 Set the G&N OPTICS MN A and MN B circuit breakers on the Right Hand Circuit breaker panel to the ON position (breaker pushed in).

6.2.5.2.21 Verify that the CRT indications of the signals in table below are not flashing.

Secondary Power Supply Voltages

Measurement Number	Signal
1. CG 1040	+120 VDC PIPA SUPPLY
2. CG 1051	+20 VDC PIPA SUPPLY
3. CG 1052	-20 VDC PIPA SUPPLY
4. CG 1070	+4 VDC CDU SUPPLY
5. CG 1100	-28 VDC ELECTRONICS
6. CG 1020	+14 VDC CMC SUPPLY
7. CG 1030	+4 VDC CMC SUPPLY
8. CG 1201	IMU 28V 800 CPS 1 pct 0 pha
9. CG 1202	IMU 28V 800 CPS 5 pct ph A
10. CG 1203	IMU 28V 800 CPS 5 pct ph B
11. CG 1331	3.2 KC 28V SUPPLY
12. CG 1110	2.5 VDC TM BIAS

6.2.5.2.22 Monitor the PIPA Display Scope to insure that each PIPA is moding properly.

6.2.5.2.23 Perform 6.2.6 G&N Operational Test.

6.2.6 G&N Operational Test

6.2.6.1 Verify the appropriate K-START tape for CM G&N OPCHK is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.6.1.1 Start tape reader.

6.2.6.1.2 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
b. R2 = +10531 (tape number)
c. R3 = -YYYZX (X is the tape revision number, YYY is the spacecraft number when assigned, and Z is the revision to the rope revision number and has meaning for tapes in Section B of Appendix II).

6.2.6.2 E-Memory Program Load and Sum Check.

6.2.6.2.1 Start tape reader.

6.2.6.2.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00101.

6.2.6.3 Local g Measurement.

6.2.6.3.1 Start tape reader.

6.2.6.3.2 In approximately 10 minutes, VERB 06 NOUN 98 shall flash.

6.2.6.3.3 From the CRT DSKY display read and record Row 1 and Row 2 (local gravity whole and fractional, respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.2.6.4 Horizontal Earth Rate Measurement.

6.2.6.4.1 Press PRO pushbutton on DSKY.

6.2.6.4.2 In approximately 2 seconds VERB 06 NOUN 98 shall flash. From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.2.6.5 Enter the following on K-148:

VERB 34 ENTR
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.2.6.6 IMU HEATER CURRENT Duty Cycle determination.

NOTE: This test is to be performed once in the VAB and at the PAD during the FRT, CDDT and CDT.

6.2.6.6.1 Record PIPA TEMP (CG 2300) reading on the CRT, CAL MOD TEMP (CG 6020) reading on the CRT and the EVAPORATOR OUTLET temperature reading.

6.2.6.6.2 Calculate the Duty Cycle for the IMU HEATER CURRENT (CG 2302) by dividing the time ON for 10 cycles by the total (ON and OFF) time for 10 cycles as indicated on the event recorder.

6.2.7 Gimbal Friction Test

6.2.7.1 Enter the following sequence into K-148:

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+17000		ENTR
+17000		ENTR
+17000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+27000		ENTR
+27000		ENTR
+27000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR
Wait 15 seconds		

6.2.7.2 Inner Gimbal Friction Test

6.2.7.2.1 Set up the ACE Analog Recorders to record the following measurements:

a. CG 2120 IG TORQUE MOTOR CURRENT
b. CG 2117 IGA SERVO ERROR IN PHASE
c. CG 2112 IG 1X RESOLVER OUTPUT SIN
d. CG 2113 IG 1X RESOLVER OUTPUT COS
e. CG 2220 IGA CDU FINE ERROR
f. CG 2221 IGA CDU Coarse Error

6.2.7.2.2 Enter the following sequence into K-148: (+360 IG torquing)

VERB 21	NOUN 01	ENTR
02757		ENTR
00000		ENTR
NOUN 15		ENTR
00000		ENTR/ENTR
40000		ENTR/ENTR
40034		ENTR/ENTR
00000		ENTR/ENTR
00000		ENTR

6.2.7.2.3 Enter the following sequence into K-148:

VERB 42	ENTR
VERB 33	ENTR

6.2.7.2.4 Start analog recorders.

6.2.7.2.5 Verify that IG Servo Error Quadrature (CG 2108) is 0.0±1.2V rms. Observe measurement CG 2112, IG 1X Resolver output SIN, on the analog recorder. When steady-state condition occurs, with the reading near zero (approximately 12 minutes), stop the recorders.

6.2.7.2.6 Return the G&N System to the coarse align mode by entering the following sequence in K-148:

VERB 40	NOUN 20	ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+17000		ENTR
+17000		ENTR
+17000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+27000		ENTR
+27000		ENTR
+27000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

6.2.7.2.7 Wait 15 seconds before proceeding.

6.2.7.2.8 Enter the following sequence into K-148: (-360° IG torquing)

VERB 24	NOUN 01	ENTR
02761	ENTR	
37777	ENTR	
37743	ENTR	

6.2.7.2.9 Enter the following sequence into K-148:

VERB 42 ENTR
VERB 33 ENTR

6.2.7.2.10 Start analog recorders.

6.2.7.2.11 Observe measurement CG 2112, IG 1X Resolver output SIN, on the analog recorder. When steady-state condition occurs, with the reading near zero (approximately 12 minutes), stop the recorders.

6.2.7.2.12 Return the G&N System to the coarse align mode by entering the following sequence into K-148:

VERB 40 NOUN 20 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.2.7.2.13 Wait 15 seconds before proceeding.

6.2.7.3 Outer Gimbal Friction Test.

6.2.7.3.1 Set up the ACE Analog Recorders to record the following measurements:

a. CG 2180 OG TORQUE MOTOR CURRENT
b. CG 2177 OGA SERVO ERROR IN PHASE
c. CG 2172 OG 1X RESOLVER OUTPUT SIN
d. CG 2173 OG 1X RESOLVER OUTPUT COS
e. CG 2280 OGA CDU FINE ERROR
f. CG 2281 OGA CDU Coarse Error

6.2.7.3.2 Enter the following sequence into K-148: (+360° OG torquing)

VERB 24	NOUN 01	ENTR
02757	ENTR	
40000	ENTR	
40034	ENTR	

6.2.7.3.3 Enter the following sequence into K-148:

VERB 42	ENTR
VERB 33	ENTR

6.2.7.3.4 Start analog recorders.

6.2.7.3.5 Verify that OG Servo Error Quadrature (CG 2168) is 0.0±1.2V rms. Observe measurement CG 2172, OG 1X Resolver output SIN, on the analog recorder. When steady-state condition occurs, with the reading near zero (approximately 12 minutes), stop the recorders.

6.2.7.3.6 Return the G&N System to the coarse align mode by entering the following sequence into K-148:

VERB 40	NOUN 20	ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+17000		ENTR
+17000		ENTR
+17000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+27000		ENTR
+27000		ENTR
+27000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000	ENTR	
+00000	ENTR	
+00000	ENTR	

6.2.7.3.7 Wait 15 seconds before proceeding.

6.2.7.3.8 Enter the following sequence into K-148: (-360° OG torquing)

```
VERB 24        NOUN 01        ENTR
02757          ENTR
37777          ENTR
37743          ENTR
```

6.2.7.3.9 Enter the following sequence into K-148:

```
VERB 42        ENTR
VERB 33        ENTR
```

6.2.7.3.10 Start analog recorders.

6.2.7.3.11 Observe measurement CG 2172, OG 1X resolver output SIN, on the analog recorder. When steady-state condition occurs, with the reading near zero (approximately 12 minutes), stop the recorder.

6.2.7.3.12 Return the G&N System to the coarse align mode by entering the following sequence into K-148:

```
VERB 40        NOUN 20        ENTR
Wait 15 seconds
VERB 41        NOUN 20        ENTR
+00000                        ENTR
+00000                        ENTR
+00000                        ENTR
Wait 15 seconds
VERB 41        NOUN 20        ENTR
+17000                        ENTR
+17000                        ENTR
+17000                        ENTR
Wait 15 seconds
VERB 41        NOUN 20        ENTR
+27000                        ENTR
+27000                        ENTR
+27000                        ENTR
Wait 15 seconds
VERB 41        NOUN 20        ENTR
+00000         ENTR
+00000         ENTR
-06750         ENTR
```

6.2.7.3.13 Wait 15 seconds before proceeding.

6.2.7.4 Middle Gimbal Friction Test.

6.2.7.4.1 Set up the ACE Analog Recorders to record the following measurements

a.	CG 2140	MG TORQUE MOTOR CURRENT
b.	CG 2147	MGA SERVO ERROR IN PHASE
c.	CG 2142	MG 1X RESOLVER OUTPUT SIN
d.	CG 2143	MG 1X RESOLVER OUTPUT COS
e.	CG 2250	MGA CDU FINE ERROR
f.	CG 2251	MGA CDU Coarse Error

6.2.7.4.2 Enter the following sequence into K-148: (+135° MG torquing)

VERB 24 NOUN 01 ENTR
02763 ENTR
63777 ENTR
77777 ENTR

6.2.7.4.3 Entr the following sequence into K-148:

VERB 42 ENTR
VERB 33 ENTR

6.2.7.4.4 Start the analog recorder.

6.2.7.4.5 Verify that MG Servo Error Quadrature (CG 2138) is 0.0±1.2V rms. Observe measurement CG 2142, MG 1X Resolver output SIN, on the analog recorder. When steady-state condition occurs (approximately 5 minutes), stop the recorders.

6.2.7.4.6 Return the G&N System to the coarse align mode by entering the following sequence into K-148:

VERB 40 NOUN 20, ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds

6.2.7.4.6 (continued)

VERB 41	NOUN 20	ENTR
+27000		ENTR
+27000		ENTR
+27000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR
Wait 15 seconds		
+00000	ENTR	
+00000	ENTR	
+06750	ENTR	

6.2.7.4.7 Enter the following sequence into K-148: (-135° MG torquing)

VERB 24	NOUN 01	ENTR
02763	ENTR	
14000	ENTR	
00000	ENTR	

6.2.7.4.8 Enter the following sequence into K-148:

VERB 42	ENTR
VERB 33	ENTR

6.2.7.4.9 Start analog recorders.

6.2.7.4.10 Observe measurement CG 2142, MG 1X Resolver output SIN, on the analog recorder. When the steady-state condition occurs (approximately 5 minutes), stop the recorders.

6.2.7.4.11 Return the G&N System to the coarse align mode by entering the following sequence into K-148:

VERB 40	NOUN 20	ENTR
VERB 41	NOUN 20	ENTR
+00000	ENTR	
+00000	ENTR	
+00000	ENTR	

6.2.7.5 Examine the traces of the recorded measurements for all six phases of this test to detect any sharp discontinuities. Disregard transients of 0.5 second duration or less on the Gimbal Torque motor current traces, disregard transients on the CDU fine error and CDU coarse error measurement traces. The Gimbal Torque motor currents shall not exceed 0.125 ampere. The CDU Fine Error measurements shall not exceed ±70 mv rms. The CDU Coarse Error measurement shall not exceed ±680 mv rms.

6.2.8 G&N Panel Brightness and Lamp Test

6.2.8.1 Proceed with this test if 6.2.5.2 or 6.2.3 has been performed and system operation has not been interrupted. If system operation has been interrupted, perform 6.2.5.2 before proceeding with this test.

6.2.8.2 Rotate the RETICLE BRIGHTNESS thumbwheel on the Control Indicator Panel and verify the capability to control the illumination of the following lamps:

a. SCT reticles
b. SXT reticles
c. Telescope Panel Angle Counters

6.2.8.3 Turn on LIGHTS-INTEGRAL control on Left Hand Circuit Breaker panel and LEB Lighting Control Panel.

6.2.8.4 Adjust the brightness controls on the LEB Lighting Control Panel and Left Hand Circuit Breaker Panel from minimum brightness to maximum brightness. Verify the operation of the G&N Indicator Control Panel lamps and LEB DSKY key lamps. Adjust MDC INTEGRAL lighting control from minimum brightness to maximum brightness and verify illuminations of MDC key lamps.

6.2.8.4.1 Re-adjust brightness controls for minimum acceptable lighting. Turn off LIGHTS-INTEGRAL control on Left Hand Circuit Breaker panel and LEB Lighting Control Panel and MDC INTEGRAL lighting.

6.2.8.5 Push and hold the CONDITION LAMPS switch on the G&N Indicator Control Panel to TEST. Verify the illumination of the following lamps:

a. STAR ACQ
b. MASTER ALARM lamp

6.2.8.6 Set the CONDITION LAMPS switch to ON. Lamps a and b in 6.2.8.5 shall extinguish.

6.2.9 Semi-Automatic Mode Test

6.2.9.1 Verify the appropriate K-START tape for CM Semi-Automatic Mode Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.9.1.1 Start tape reader.

6.2.9.1.2 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
b. R2 = +10530 (tape number)
c. R3 = -YYYZX (X is the tape revision number, YYY is the spacecraft number when assigned, and Z is the revision to the rope revision number and has meaning for tapes in Section B of Appendix II).

6.2.9.2 E-Memory Program Load

6.2.9.2.1 Start tape reader.

6.2.9.2.2 When tape reader stops verify the following on CRT DSKY:

R1 = 00101

6.2.9.3 Command Accuracy 0°.

6.2.9.3.1 Start tape reader

6.2.9.3.2 When tape stops verify that CRT DSKY R1 indicates 00201. Wait 15 seconds.

6.2.9.3.3 Read and record CRT IMU Gimbal angles. The indications shall be 000±003 degrees.

6.2.9.3.4 Read and record CRT CDU angle indications. The indications shall be +000.00±001.50.

6.2.9.4 Command Accuracy 45°.

6.2.9.4.1 Start tape reader.

6.2.9.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00301. Wait 5 seconds.

6.2.9.4.3 Read and record CRT IMU Gimbal angles. The indications shall be 045±003 degrees.

6.2.9.4.4 Read and record CRT CDU angle indications. Indications shall be +045.00±001.50.

6.2.9.5 CDU Repeating Accuracy 45°.

6.2.9.5.1 Start the tape reader.

6.2.9.5.2 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.6 Command accuracy 90°.

6.2.9.6.1 Start tape reader.

6.2.9.6.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00501. GIMBAL LOCK lamp will be lighted. Wait 5 seconds.

6.2.9.6.3 Read and record CRT indication of IMU Gimbal angles. The indications shall be 090±003 degrees.

6.2.9.6.4 Read and record CRT CDU angle indications. Indications shall be +090.00±001.50.

6.2.9.7 Command Accuracy 135°.

6.2.9.7.1 Start tape reader.

6.2.9.7.2 When tape reader stops verify CRT DSKY Row 1 indicates 00601. Wait 5 seconds.

6.2.9.7.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 135±003 degrees.

6.2.9.7.4 Read and record CRT CDU angle indications. Indications shall be +135.00±001.50.

6.2.9.8 CDU Repeating Accuracy 135°.

6.2.9.8.1 Start tape reader.

6.2.9.8.2 When tape reader stops verify CRT DSKY Row 1 indicates 00701. Wait 10 seconds, verify GIMBAL LOCK lamp on DSKY is not lighted.

6.2.9.8.3 Start tape reader.

6.2.9.8.4 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 will flash. Read and record CRT DSKY Row 1, 2 and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.9 Plus Gimbal Lock Test.

6.2.9.9.1 Start tape reader.

6.2.9.9.2 When tape reader stops wait approximately 10 seconds. Verify CRT DSKY Row 1 indicates 01101. Verify GIMBAL LOCK lamp is lighted.

6.2.9.10 Command Accuracy 225°.

6.2.9.10.1 Start tape reader.

6.2.9.10.2 When tape reader stops verify CRT DSKY Row 1 indicates 01201. GIMBAL LOCK lamp will be lighted. Wait 15 seconds.

6.2.9.10.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 225±003 degrees.

6.2.9.10.4 Read and record CRT CDU angle indications. Indications shall be +225.00±001.50.

6.2.9.11 ISS CDU Command Rate Test

6.2.9.11.1 Start tape reader.

6.2.9.11.2 When tape reader stops verify CRT DSKY display Row 1 indicates 01301. Wait 10 seconds. Verify IMU Gimbals are at approximately 0° and GIMBAL LOCK lamp is OFF.

6.2.9.11.3 Middle Gimbal Rate Test

6.2.9.11.3.1 Start tape reader.

6.2.9.11.3.2 When tape reader stops immediately verify display of 01401 in Row 1 of CRT DSKY display. In approximately 12 seconds VERB 23 NOUN 26 shall flash. The GIMBAL LOCK lamp shall be lit. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.2.9.11.4 Inner Gimbal Rate Test

6.2.9.11.4.1 Start tape reader.

6.2.9.11.4.2 Approximately 12 seconds after the tape reader stops VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.2.9.11.5 Outer Gimbal Rate Test.

6.2.9.11.5.1 Start tape reader.

6.2.9.11.5.2 Approximately 12 seconds after the tape reader stops VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.2.9.11.6 Start tape reader.

6.2.9.11.6.1 Wait 15 seconds. Verify IMU Gimbals are at approximately 0° and GIMBAL LOCK LAMP is OFF.

6.2.9.12 Command Accuracy 315°.

6.2.9.12.1 Start tape reader.

6.2.9.12.2 When tape reader stops verify CRT DSKY Row 1 indicates 01501.

6.2.9.12.3 Read and record CRT IMU Gimbal Angles. Indication shall be 315±003 degrees.

6.2.9.12.4 Read and record CRT CDU angle indications. Indications shall be +315.00±001.50.

6.2.9.13 CDU Repeating Accuracy 315°.

6.2.9.13.1 Start tape reader.

6.2.9.13.2 Approximately 5 seconds after the tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.14 Minus Gimbal Lock Test.

6.2.9.14.1 Start tape reader.

6.2.9.14.2 When tape reader stops verify CRT DSKY Row 1 indicates 01701. Verify GIMBAL LOCK lamp is lighted after approximately 5 seconds.

6.2.9.15 CDU Repeating Accuracy 225°.

6.2.9.15.1 Start tape reader.

6.2.9.15.2 When tape reader stops verify CRT DSKY Row 1 indicates 02001. Wait 10 seconds before continuing. Verify GIMBAL LOCK lamp is OFF.

6.2.9.15.3 Start tape reader.

6.2.9.15.4 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 will flash. Read and record CRT DSKY Row 1, 2 and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.16 OG CDU Fine Fail Test.

6.2.9.16.1 Start tape reader.

6.2.9.16.2 When tape reader stops verify CRT DSKY Row 1 indicates 02101.

6.2.9.16.3 Start tape reader.

6.2.9.16.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.16.5 Start tape reader.

6.2.9.16.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is OFF. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.17 IG CDU Fine Fail Test

6.2.9.17.1 Start tape reader.

6.2.9.17.2 When tape reader stops verify CRT DSKY Row 1 indicates 02201.

6.2.9.17.3 Start tape reader.

6.2.9.17.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.17.5 Start tape reader.

6.2.9.17.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.18 MG CDU Fine Fail Test.

6.2.9.18.1 Start tape reader.

6.2.9.18.2 When tape reader stops verify CRT DSKY Row 1 indicates 02301.

6.2.9.18.3 Start tape reader.

6.2.9.18.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.18.5 Start tape reader.

6.2.9.18.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.19 OG CDU Coarse Fail Test

6.2.9.19.1 Start tape reader.

6.2.9.19.2 When tape reader stops verify CRT DSKY Row 1 indicates 02401.

6.2.9.19.3 Start tape reader.

6.2.9.19.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.19.5 Start tape reader.

6.2.9.19.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.20 IG CDU Coarse Fail Test

6.2.9.20.1 Start tape reader.

6.2.9.20.2 When tape reader stops verify CRT DSKY Row 1 indicates 02501.

6.2.9.20.3 Start tape reader.

6.2.9.20.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.20.5 Start tape reader.

6.2.9.20.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.21 MG CDU Coarse Fail Test

6.2.9.21.1 Start tape reader.

6.2.9.21.2 When tape reader stops verify CRT DSKY Row 1 indicates 02601.

6.2.9.21.3 Start tape reader.

6.2.9.21.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

OPTICS CDU FINE ERROR TESTS

6.2.9.23.4 Start tape reader. When tape reader stops, verify R1 = 03000. Set the OPTICS MODE switch to CMC. Set OPTICS ZERO switch to OFF.

6.2.9.23.5 Start tape reader. When tape reader stops, verify R1 = 03001. Within 10 seconds after tape reader stops, verify TRACKER fail lamp and PGNCS CAUTION lamp ON.

6.2.9.23.6 Start tape reader. When tape reader stops, verify TRACKER fail and PGNCS CAUTION lamp OFF.

6.2.9.23.7 Set OPTICS ZERO switch to ZERO. Wait 20 seconds. Start tape reader. When tape reader stops, verify R1 = 03003. Set ZERO OPTICS switch to OFF.

6.2.9.23.8 Start tape reader. When tape reader stops, verify R1 = 03004. Within 10 seconds after tape reader stops, verify TRACKER fail and PGNCS CAUTION lamps ON.

6.2.9.23.9 Start tape reader. When tape reader stops, verify R1 = 03005, and TRACKER fail and PGNCS CAUTION lamps OFF.

6.2.9.23.10 Set OPTICS ZERO switch to ZERO. Wait 20 seconds.

6.2.9.23.11 Start tape reader. When tape reader stops, verify R1 = 03006.

6.2.9.24 Computer Manual Mode Optics Drive

NOTE: Perform the following procedure only if GNIC panel, P/N 2021290-51 is installed in the spacecraft.

6.2.9.24.1 Place the OPTICS ZERO switch on the Indicator Control Panel to ZERO and the OPTICS MODE switch to CMC.

6.2.9.24.1.1 Wait 20 seconds and then place the OPTICS ZERO switch on the Indicator Control Panel to OFF.

6.2.9.24.1.2 Perform the following on the DSKY:

VERB 41 NOUN 91 ENTR
+00000 ENTR
+00000 ENTR

6.2.9.24.2 Place the OPTICS MODE switch on the Indicator Control Panel to MANUAL. Perform the following step within 1 minute.

6.2.9.24.2.1 Perform the following on the DSKY:

VERB 21 NOUN 10 ENTR
00012 ENTR
00002 ENTR

6.2.9.24.2.2 Perform the following on the DSKY:

VERB 16 NOUN 91 ENTR

Record R1 and R2 when the values settle out.

6.2.9.24.2.3 Set the OPTICS ZERO switch to ZERO.

6.2.9.24.2.4 Perform the following on the DSKY after a 10-second delay:

VERB 24 NOUN 01 ENTR
00053 ENTR
00360 ENTR
00360 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00002 ENTR/ENTR
00014 ENTR
06000 ENTR

6.2.9.24.2.5 Set the OPTICS ZERO switch on the Indicator Control Panel to OFF.

6.2.9.24.2.6 Press the Key Release pushbutton. Record R1 and R2 when they are settled out.

6.2.9.24.2.7 Perform the following calculations for Shaft and Trunnion. Subtract the values of R1 and R2 from Step 6.2.9.24.2.2 from the respective values of R1 and R2 of Step 6.2.9.24.2.6.

Verify $R1_6 - R1_2 = 10.65$ deg ±1.00 deg.

and $R2_6 - R2_2 = 2.66$ deg ±0.26 deg

6.2.9.24.3 Set the SPEED switch to "MED" and the DIRECT/RESOLVED switch to DIRECT.

6.2.9.24.4 Set the OPTICS Hand Controller full right. Record R1 and release the Hand Controller.

6.2.9.24.4.1 Set the OPTICS Hand Controller full left. Record R1 and release the Hand Controller.

6.2.9.24.4.2 Perform the following calculations for Shaft. Subtract the value of R1 from Step 6.2.9.24.2.6 ($R1_{26}$) from the value of R1 recorded in Step 6.2.9.24.4 ($R1_{40}$).

Verify $R1_{40} - R1_{26} = 1.63$ deg ±0.49 deg.

Subtract the value of R1 from Step 6.2.9.24.2.6 ($R1_{26}$) from the value of R1 recorded in Step 6.2.9.24.4.1 ($R1_{41}$).

Verify $R1_{41} - R1_{26} = -1.63$ deg ±0.49 deg.

6.2.9.24.4.3 Set the OPTICS Hand Controller full up. Record R2 and release the Hand Controller.

6.2.9.24.4.4 Set the OPTICS Hand Controller full down. Record R2 and release the Hand Controller.

6.2.9.24.4.5 Perform the following calculations for Trunnion. Subtract the value of R2 from Step 6.2.9.24.2.6 ($R2_{26}$) from the value of R2 recorded in Step 6.2.9.24.4.3 ($R2_{43}$).

Verify $R2_{43} - R2_{26} = 0.40$ deg ±0.12 deg.

Subtract the value of R2 from Step 6.2.9.24.2.6 ($R2_{26}$) from the value of R2 recorded in Step 6.2.9.24.4.4 ($R2_{44}$).

Verify $R2_{44} - R2_{26} = -0.40$ deg ±0.12 deg.

6.2.9.24.5 Perform the following on the DSKY:

VERB 21 NOUN 10 ENTR
00012 ENTR
00000 ENTR

6.2.9.25 Set the G/N Power-Optics Switch on the LEB lighting control panel to OFF.

6.2.10 Zero Optics Test

6.2.10.1 Set the G&N POWER-OPTICS switch on the LEB to OPTICS. Verify Power Supplies.

NOTE: Proceed with this test if 6.2.3 Operate Power on test has been completed and system operation has not been interrupted. If system operation has been interrupted perform 6.2.5.2. Turn On Procedure before proceeding.

INITIALIZATION

6.2.10.2 Insure that the following switches on the G&N Indicator Control Panel are set as follows:

a. OPTICS TEL TRUN to SLAVE to SXT
b. OPTICS COUPLING to DIRECT
c. OPTICS SPEED to HI
d. OPTICS MODE to MAN

OPTICS ZERO MODE TEST

6.2.10.3 Monitor the Optics CDU's by entering VERB 16 NOUN 91 ENTER into K-148.

6.2.10.4 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +5 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Indicator Control Panel to ZERO. Wait 15 seconds. Verify the Optics have zeroed properly by observing the following on R1 and R2 of the CRT.

a. R1 = +0.00° +0.02°, -0.03° (Shaft Angle)
b. R2 = +0.000° +0.006°, -0.007° (Trunnion Los Angle)

6.2.10.4.1 Enter the following:

VERB 01 NOUN 10, ENTER
00033 ENTER

Verify R1 = XXX6X

6.2.10.4.2 Set the OPTICS ZERO switch to OFF and the OPTICS MODE switch to CMC. Enter the following:

ENTER
00033, ENTER

Verify R1 = XXX5X

6.2.10.4.3 Set the OPTICS MODE switch to MAN. Press the KEY-REL pushbutton.

OPTICS BACKUP MODE TEST

6.2.10.5 Insert the Inflight Tool (V36601405) into the Trunnion Tool input and engage drive mechanism (button out). Verify that the trunnion turns by viewing the movement through the SCT eyepiece while turning the tool until the TPAC reads +5°. Remove the tool from the Trunnion tool input.

6.2.10.6 Insert the Inflight Tool (V36601405) into the Shaft Tool input and engage the drive mechanism (button out). Verify that the Shaft turns by viewing the movement through the SCT eyepiece while turning the tool so that the shaft moves through an angle from 0° to +3° to 0° as indicated on the shaft TPAC. Disengage the shaft drive mechanism (button in) and remove the tool.

6.2.10.7 Insert the Inflight Tool (V36601405) into the Trunnion Tool input. Verify that the Trunnion turns by viewing the movement through the SCT eyepiece while turning the tool so that the trunnion moves from +5° to -5° and back to zero as indicated on the Trunnion TPAC. Disengage the trunnion drive mechanism (button in) and remove the tool.

6.2.11 Optics Coordinate Transformation Control Test.

6.2.11.1 Set the G/N POWER-OPTICS switch on the LEB to OPTICS. Verify Power Supplies.

NOTE: Proceed with this test if 6.2.3 Operate Power On Test has been completed and system operation has not been interrupted. If system operation has been interrupted, perform 6.2.5.2, Turn On Procedure, before proceeding.

INITIALIZATION

6.2.11.2 Verify and/or set the following switches on the G&N Indicator Control Panel to the position indicated.

a. OPTICS TEL TRUN to SLAVE to SXT
b. OPTICS COUPLING to DIRECT
c. OPTICS SPEED to HI
d. OPTICS MODE to MAN

6.2.11.3 Enter the following into K-148:

VERB 16 NOUN 91 ENTR

6.2.11.4 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +5 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Panel to ZERO. Wait 15 seconds. Return the OPTICS ZERO switch to OFF.

6.2.11.5 Set up the analog recorders to monitor the following measurements:

a. CG 3170 SCT Trunnion Tachometer Output

RESOLVED MODE PHASING AND IMAGE RATE TEST.

6.2.11.6 Using the OPTICS CONTROL STICK, drive the Optics until R1 = +225.00 and R2 = +10.000 on the CRT and the DSKY's.

6.2.11.7 Set the OPTICS COUPLING switch on the G&N Panel to RSLV and the OPTICS Speed switch to MED.

6.2.11.8 Position the movable optics target such that it is centered on the SCT reticle pattern.

6.2.11.9 Record time. Quickly displace the OPTICS CONTROL STICK 45±10 degrees in the upper right hand quadrant while sighting on the optics target through the SCT eyepiece. The target shall appear to move in the upper right field of view of the SCT at 45±10 deg. When target leaves the SCT upper right field of view press MARK pushbutton. The PROG alarm lamp shall light.

6.2.11.10 From the uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the Shaft CDU register (address 36) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) and the PROG alarm discrete for the period during which the OPTICS CONTROL STICK was being displaced above. The Shaft CDU angle shall be 225.00±10.00 degrees at the time the PROG alarm occurred. The elapsed time from time of OPTICS CONTROL STICK displacement to the time the PROG alarm discrete is obtained shall be 19 to 32 seconds.

6.2.11.11 Set the OPTICS COUPLING switch to DIRECT. Again using the OPTICS CONTROL STICK, drive the optics until R1 = +225.00 and R2 = +10.000. Set the OPTICS COUPLING switch to RSLV.

6.2.11.12 While sighting on the optical target through the SCT eyepiece, displace the OPTICS CONTROL STICK fully to the right. Verify that the target image appears to move in a straight line horizontally to the right and release the OPTICS CONTROL STICK when the target image reaches the edge of the SCT field of view.

6.2.11.13 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within ±5 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS COUPLING switch on the G&N Panel to DIRECT. Set the OPTICS ZERO switch to ZERO.

6.2.12 Optics Functional Test

6.2.12.1 Set/verify the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify the following:

a. +28 VDC OPTX OPERATE BUS (CG 1530) is 28.8±3 VDC. Record the indication on the CRT.

b. CG 1211 OPTX 28V 800 cps 1% 0 ph not flashing on CRT.

c. CG 1212 OPTX 800 cps 5% -90 ph not flashing on CRT.

6.2.12.2 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within ±5 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Insure that the Optics control switches on the G&N Indicator Control Panel are set as follows:

a. OPTICS ZERO to ZERO
b. OPTICS MODE to MAN
c. OPTICS SPEED to LO
d. OPTICS COUPLING to DIRECT
e. OPTICS TRUN to SLAVE to SXT

6.2.12.3 Set OPTICS ZERO switch to OFF.

6.2.12.4 Resolution checks

6.2.12.4.1 SXT Resolution Check - MSO only

6.2.12.4.1.1 Sight through the SXT eyepiece. Using the OPTICS CONTROL STICK adjust the SXT to obtain the best reflected field of view of the 5-inch autocollimator reticle engravings at the center of view.

6.2.12.4.1.2 Note that the autocollimator reticle contains a series of lines of different thickness and width. Each set of lines is marked with a number (20, 15, 10, 7, 5, 3) which indicates the angle subtended by one line and one space. View each set of lines to determine the lowest numbered set in which resolution between lines (ability to distinguish separate distinct lines within a set) can be made. Record the number associated with that set of lines. The SXT resolution shall be at least 10 arc seconds at the center of the field of view.

6.2.12.4.2 SCT Resolution Check

6.2.12.4.2.1 Sight through the SCT EYEPIECE. Using the OPTICS CONTROL STICK adjust the SCT to obtain the best view of the SCT RESOLUTION CHART held in the Optics line of sight.

6.2.12.4.2.2 Note the chart contains sets of lines. View each set of lines to determine the lowest numbered set in which the resolution between lines (ability to distinguish separate lines within a set) can be made. The SCT shall have a resolution of at least 3 arc minutes at the center of the field of view.

6.2.12.5 Slave Telescope Mode Checks

6.2.12.5.1 Verify/perform OPTICS POWER ON TEST per paragraph 6.2.3.2.

6.2.12.5.2 Set/verify following switches on G&N INDICATOR CONTROL PANEL:

a. OPTICS TEL TRUN - SLAVE to SXT
b. OPTICS COUPLING - DIRECT
c. OPTICS SPEED - HI

6.2.12.5.3 Monitor OCDU's by entering VERB 16 NOUN 91, ENTER into K-148.

6.2.12.5.4 Set OPTICS MODE to MAN.

6.2.12.5.5 Using the Optics Hand Controller drive the optics until:

R1 = +000.00±001.00 (SHAFT)
R2 = +10.000±01.000 (TRUNNION)

6.2.12.5.6 Verify on the CRT and Optics Panel:

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = R2 ±0.22 DEG

6.2.12.5.7 Set the OPTICS TEL TRUN on the G&N INDICATOR CONTROL PANEL to 0°.

6.2.12.5.8 Verify:

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = 0.0° ±0.22 DEG

R2 approximately equal to value specified in step 6.2.12.5.5.

6.2.12.5.9 Set the OPTICS TEL TRUN on the G&N INDICATOR CONTROL PANEL to OFFSET 25°.

6.2.12.5.10 Verify on CRT and Optics Panel:

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = 25° ±1.00 DEG
R2 approximately equal to value specified in step 6.2.12.5.5.

6.2.12.5.11 On the G&N INDICATOR CONTROL PANEL set the OPTICS TEL TRUN to SLAVE to SXT.

6.2.12.5.12 Verify on CRT and Optics Panel:

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = R2 ±0.22 DEG

6.2.12.5.13 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +5 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). On the G&N INDICATOR CONTROL PANEL set the OPTICS ZERO to ZERO. Wait 15 sec.

6.2.12.5.14 Verify on CRT and OPTICS PANEL.

R1 = 000.00 +000.02, -000.03
R2 = 00.000 +00.006, -00.007

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = R2 ±0.22 DEG

6.2.12.5.15 If Optics testing will not be continued, set the G&N POWER-OPTICS switch on the LEB Lighting Control Panel to OFF.

6.2.12.6 SXT Parallelism Tests

6.2.12.6.1 Remove the plug from the base of the SXT eyepiece and install the Adapter Assembly and Portable Light Assembly. Turn on the light.

NOTE: If needed to reduce external light, place a photographers hood over the optics head.

6.2.12.6.2 SXT Auto Collimator Parallelism Test - MSO only.

6.2.12.6.2.1 Using the OPTICS CONTROL STICK drive the SXT StLOS Trunnion to +15.00° ±2° as indicated in R2 of the DSKY. Maintain a Shaft CDU angle of 000.00±0.10 degrees.

6.2.12.6.2.2 Sight through the 5-inch autocollimator eyepiece and adjust the measurement knob to superimpose the SXT LLOS horizontal reticle image upon the autocollimator horizontal filar. Record the autocollimator reading.

6.2.12.6.2.3 Repeat 6.2.12.6.2.2 twice. Calculate and record the average of the three autocollimator readings.

6.2.12.6.2.4 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +5 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO.

6.2.12.6.2.5 Again sight through the 5-inch autocollimator eyepiece and adjust the measurement knob to bring the SXT StLOS horizontal reticle and autocollimator horizontal filar images to coincide. Record the autocollimator reading.

6.2.12.6.2.6 Repeat 6.2.12.6.2.5 twice. Calculate and record the average of the three autocollimator readings. The average value obtained here shall not differ from that obtained in 6.2.12.1 by more than 10 arc seconds.

6.2.12.7 SXT, CMC Functional Check

6.2.12.7.1 Set the OPTICS MODE switch to MAN. Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within ±5 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT).

Set the OPTICS ZERO switch to ZERO. After 15 seconds, return the switch to OFF.

6.2.12.7.2 Sight through the SXT. Using the Control Stick align the SXT StLOS with Optical Target No. 1.

6.2.12.7.3 When aligned, record the value of the Shaft and Trunnion CDU's from the CRT.

6.2.12.7.4 Sight through the SXT. Using the Control Stick align the SXT StLOS with Optical Target No. 2.

6.2.12.7.5 When aligned, record the value of the Shaft and Trunnion CDU's from the CRT.

6.2.12.7.6 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within ±5 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Indicator Control Panel to ZERO. After 15 seconds set the OPTICS ZERO switch to OFF. Set the OPTICS MODE switch to CMC.

6.2.12.7.7 Enter VERB 41, NOUN 91, ENTER into the DSKY. Enter the value for Shaft from 6.2.12.7.3 into the DSKY and press ENTER. Enter the value for Trunnion from 6.2.12.7.3 into the DSKY and press ENTER.

6.2.12.7.8 Sight through the SXT. The StLOS should be approximately centered on the Optical Target No. 1. Record the value of Shaft and Trunnion CDU's from the CRT. The difference between these values and the corresponding values recorded in 6.2.12.7.3 shall be less than 0.06 degrees for the Shaft and 0.02 degrees for the Trunnion. Record the difference.

6.2.12.7.9 Enter VERB 41, NOUN 91, ENTER into the DSKY. Enter the value for Shaft from 6.2.12.7.5 into the DSKY and press the ENTER pushbutton. Enter the value for Trunnion from 6.2.12.7.5 into the DSKY and press the ENTER pushbutton.

6.2.12.7.10 Sight through the SXT. The StLOS should be approximately centered on the Optical Target No. 2. Record the value of Shaft and Trunnion CDU's from the CRT. The difference between these values and the corresponding values recorded in 6.2.12.7.5 shall be less than 0.06 degrees for the Shaft and 0.02 degrees for the Trunnion. Record the difference.

6.2.12.7.11 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +5 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds.

6.2.12.7.12 If OPTICS testing will not continue, set the G&N Power Optics switch on the LEB Lighting Panel to OFF.

6.2.13 Optics Slew Rate Tests

6.2.13.1 Optics Hand Controller Rates

6.2.13.1.1 Verify the appropriate K-Start tape for OPT H/C SLEW RATE & RATE SF is on the K-Start reader. The tape numbers and their associated Flight Ropes are found in Appendix II. Start the tape reader. When tape reader stops, verify the following on the CRT DSKY display:

(a) R1 = YYYYY (The value is Flight Rope dependent and is found in Appendix II.)

(b) R2 = +10598

(c) R3 = -YYYZX (X is tape revision number, YYY is the spacecraft number when assigned, and Z is the revision to the rope revision number and has meaning for tapes in Section B of Appendix II.)

6.2.13.1.2 Start the tape reader. When tape reader stops, verify R1 = 00100.

6.2.13.1.3 Set/Verify the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify that +28 VDC OPTICS OPERATE BUS (CG 1530) is +28.0±3.0 VDC. Verify that OPTX 28V 800 cps 1% zero (CG 1211) and OPTX 28V 800 cps 5%-90 ph (CG 1212) are not flashing on the CRT.

6.2.13.1.4 Verify and/or set the following switches on the G&N Indicator Control Panel to the positions indicated.

(a) TEL TRUN to SLAVE to SXT
(b) OPTICS COUPLING to DIRECT
(c) OPTICS SPEED to HI
(d) OPTICS MODE to MAN
(e) OPTICS ZERO to OFF

POSITIVE SHAFT SLEW RATE - HI SPEED

6.2.13.1.5 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +5 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Indicator Control Panel to ZERO. Wait 15 seconds. Return OPTICS SPEED to HI.

NOTE: Read and understand the next three steps before proceeding.

6.2.13.1.6 While slewing the optics, record the following signals: SXT SHAFT SERVO error (CG 3117), SXT SHAFT TACH (CG 3140), and SCT SHAFT TACH (CG 3160). CG 3117 shall be less than -0.25 VRMS. CG 3140 shall be 3.3±1.3 VRMS. CG 3160 shall be -3.3±1.3 VRMS.

6.2.13.1.7 Start tape reader. When the tape reader stops, verify R1 = 00101.

6.2.13.1.8 Set the OPTICS ZERO switch on the G&N Indicator Control Panel to OFF. Immediately push and hold the OPTICS CONTROL STICK to its right limit until the shaft on TPAC reading indicates 175 degrees. Release the Control Stick. VERB 23 NOUN 26 shall be displayed flashing on DSKY. Record the R1 and R2 display (R1 is whole part and R2 is fractional part (deg/sec)). Value recorded shall be 19.5±3.9 deg/sec.

POSITIVE TRUNNION SLEW RATE - HI SPEED

NOTE: Read and understand the next two steps before proceeding.

6.2.13.1.9 While slewing the optics after the tape load, record the following signals: SXT TRUN SERVO error (CG 3118), SXT TRUN TACH (CG 3150) and SCT TRUN TACH (CG 3170). CG 3118 shall be less than -0.25 VRMS. CG 3150 shall be 3.3±1.3 VRMS. CG 3170 shall be -0.85±0.35 VRMS.

6.2.13.1.10 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED drive the Optics Trunnion to 0±1 degree as indicated on the TPAC. Return OPTICS SPEED to HI. Immediately start the tape reader. When tape reader stops, verify R1 = 00102. Within 10 seconds push and hold the OPTICS CONTROL STICK to its upper limit until the Trunnion TPAC reading indicates 50 degrees. Release the OPTICS CONTROL STICK. VERB 23 NOUN 26 shall be displayed flashing on the DSKY. Record R1 and R2 display (R1 as whole part and R2 as fractional part (deg/sec)). Value recorded shall be 10±2 deg/sec.

NEGATIVE SHAFT SLEW RATE - HI SPEED

NOTE: Read and understand the next step before proceeding.

6.2.13.1.11 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED drive the optics shaft to 175±1 deg as indicated on the TPAC. Return OPTICS SPEED to HI. Immediately start the tape reader. When tape reader stops, verify R1 = 00103. Within 10 seconds push and hold the OPTICS CONTROL STICK to its left limit until the shaft TPAC reading indicates 0 degrees. Release the OPTICS CONTROL STICK. VERB 23 NOUN 26 shall be displayed flashing on the DSKY. Record R1 and R2 display (R1 as whole part and R2 is fractional part (deg/sec)). Value recorded shall be -19.5±3.9 deg/sec.

NEGATIVE TRUNNION SLEW RATE - HI SPEED

NOTE: Read and understand the next step before proceeding.

6.2.13.1.12 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED drive the optics trunnion to 50±1 deg as indicated on the TPAC. Return OPTICS SPEED switch to HI. Immediately start the tape reader. When tape reader stops verify R1 = 00104. Within 10 seconds, push and hold the OPTICS CONTROL STICK to its lower limit until the trunnion TPAC reading indicates 5 degrees. Release the OPTICS CONTROL STICK. VERB 23 NOUN 26 shall be displayed flashing on the DSKY. Record R1 and R2 display (R1 as whole part and R2 as fractional part (deg/sec)). Value recorded shall be -10±2.0 deg/sec.

6.2.13.1.12.1 Start tape reader. When tape reader stops, verify R1 = 00105.

POSITIVE SHAFT SLEW RATE - MED SPEED

6.2.13.1.13 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +5 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set OPTICS SPEED to MED.

NOTE: Read and understand the next three steps before proceeding.

6.2.13.1.14 Record the SXT SHAFT MTR control winding (CG 3145) signal on the CRT while slewing the optics. CG 3145 shall be +0.50 to +4.0 VRMS.

6.2.13.1.15 Start tape reader. When the tape reader stops, verify R1 = 00106.

6.2.13.1.16 Set the OPTICS ZERO switch on the G&N Indicator Control Panel to OFF. Immediately push and hold the OPTICS CONTROL STICK to its right limit until the shaft TPAC reading indicates 135 degrees. Release the control stick. VERB 23 NOUN 26 shall be displayed flashing on the DSKY. Record the R1 and R2 display (R1 is whole part and R2 is fractional part (deg/sec)). Value recorded shall be 2.0±0.4 deg/sec.

POSITIVE TRUNNION SLEW RATE - MED SPEED

NOTE: Read and understand the next two steps before proceeding.

6.2.13.1.17 Record the SXT TRUN MTR control winding (CG 3155) signal on the CRT while slewing the optics after the tape load. CG 3155 shall be +0.25 to +2.00 VRMS.

6.2.13.1.18 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED drive the Optics Trunnion to 0±1 deg as indicated on the TPAC. Return OPTICS SPEED to MED. Immediately start the tape reader. When tape reader stops, verify R1 = 00107. Within 10 seconds push and hold the OPTICS CONTROL STICK to its upper limit until the trunnion TPAC reading indicates

47 degrees. Release the OPTICS CONTROL STICK. VERB 23 NOUN 26 shall be displayed flashing on the DSKY. Record R1 and R2 display (R1 is whole part and R2 is fractional part (deg/sec)). Value recorded shall be -2.0±0.4 deg/sec.

NEGATIVE SHAFT SLEW RATE - MED SPEED

NOTE: The next step must be performed within 5 minutes of the completion of the Medium Speed Positive Shaft Slew Rate Test.

6.2.13.1.19 Start the tape reader. When tape reader stops, verify R1 = 00110. Push and hold the OPTICS CONTROL STICK to its left limit until the shaft TPAC reading indicates 0 deg. Release the OPTICS CONTROL STICK. VERB 23 NOUN 26 shall be displayed flashing on the DSKY. Record R1 and R2 display (R1 is whole part and R2 is fractional part (deg/sec)). Value recorded shall be -2.0±0.4 deg/sec.

NEGATIVE TRUNNION SLEW RATE - MED SPEED

NOTE: The next step must be performed within 5 minutes of the completion of the Medium Speed Positive Trunnion Slew Rate Test.

6.2.13.1.20 Start the tape reader. When the tape reader stops, verify R1 = 00111. Push and hold the OPTICS CONTROL STICK to its lower limit until the trunnion TPAC reading indicates 0 deg. Release the OPTICS CONTROL STICK. VERB 23 NOUN 26 shall be displayed flashing on the DSKY. Record R1 and R2 display (R1 is whole part and R2 is fractional part (deg/sec)). Value recorded shall be -1.0±0.2 deg/sec.

6.2.13.1.20.1 Start tape reader. When tape reader stops, verify R1 = 00112.

POSITIVE SHAFT SLEW RATE - LO SPEED

6.2.13.1.21 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT trunnion to within +5 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set OPTICS SPEED to LO.

6.2.13.1.22 Start tape reader. When the tape reader stops, verify R1 = 00113. Set the OPTICS ZERO switch on the G&N Indicator Control Panel to OFF. Immediately push and hold the OPTICS CONTROL STICK to its right limit until the shaft TPAC reading indicates 17 degrees. Release the control stick. VERB 23 NOUN 26 shall be displayed flashing on the DSKY. Record the R1 and R2 display (R1 is whole part and R2 is fractional part (deg/sec)). Value recorded shall be 0.20±0.04 deg/sec.

POSITIVE TRUNNION SLEW RATE - LO SPEED

NOTE: Read and understand the next step before proceeding.

6.2.13.1.23 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED drive the Optics Trunnion to 0±1 deg as indicated on the TPAC. Return OPTICS SPEED to LO. Immediately start the tape reader. When tape reader stops verify R1 = 00114. Within 10 seconds push and hold the OPTICS CONTROL STICK to its upper limit until the trunnion TPAC reading indicates 7 degrees. Release the OPTICS CONTROL STICK. VERB 23 NOUN 26 shall be displayed flashing on the DSKY. Record R1 and R2 display (R1 is whole part and R2 is fractional part (deg/sec)). Value recorded shall be +0.1±0.02 deg/sec.

NEGATIVE SHAFT SLEW RATE - LO SPEED

NOTE: The following step must be performed within 5 minutes of completing the Low Speed Positive Shaft Slew Rate Test.

6.2.13.1.24 Start the tape reader. When tape reader stops verify R1 = 00115. Push and hold the OPTICS CONTROL STICK to its left limit until the shaft TPAC reading indicates 0 degree. Release the OPTICS CONTROL STICK. VERB 23 NOUN 26 shall be displayed flashing on the DSKY. Record R1 and R2 display (R1 is whole part and R2 is fractional part (deg/sec)). Value recorded shall be -0.2±0.04 deg/sec.

NEGATIVE TRUNNION SLEW RATE - LO SPEED

NOTE: The following step must be performed within 5 minutes of completing the Low Speed Trunnion Slew Rate Test.

6.2.13.1.25 Start the tape reader. When tape reader stops verify R1 = 00116. Push and hold the OPTICS CONTROL STICK to its lower limit until the shaft TPAC reading indicates 0 degree. Release the OPTICS CONTROL STICK. VERB 23 NOUN 26 shall be displayed flashing on the DSKY. Record R1 and R2 display (R1 is whole part and R2 is fractional part (deg/sec)). Value recorded shall be -0.1±0.02 deg/sec.

TEST TERMINATION

6.2.13.1.26 Start tape reader. When tape reader stops, verify R1 = 00117.

OPTICS HAND CONTROLLER DRIFT RATE CHECK - LO SPEED

6.2.13.2 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +5 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT.) Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF. Record time. Wait 60 seconds.

6.2.13.3 Perform the following calculations:

From the uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the Trunnion and Shaft CDU registers (addresses 35 and 36 respectively) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 60 second period during which the drift rate test was being performed.

Calculate the drift rate by dividing the ΔCDU angles by the elapsed time.

The Trunnion drift rate shall be less than .0167 deg/sec.

The Shaft drift rate shall be less than .0333 deg/sec.

6.2.13.4 If OPTICS testing will not continue; set the G/N Power-Optics switch on the LEB Lighting Control Panel to OFF.

6.2.13.5 Optics Rate SF

6.2.13.5.1 Verify OPT H/C SLEW RATE & RATE SF K-Start Tape is on the tape reader to Section 00200. The tape numbers and their associated Flight Ropes are found in Appendix II. Start tape reader.

6.2.13.5.2 When tape reader stops, verify R1 = 00200.

6.2.13.5.3 Verify and/or set the following switches on the G&N Indicator Control Panel to the position indicated.

(a) TEL TRUN to SLAVE to SXT
(b) OPTICS COUPLING to DIRECT
(c) OPTICS SPEED to LO
(d) OPTICS MODE to MAN
(e) OPTICS ZERO to OFF

6.2.13.5.4 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT trunnion to within +5 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Indicator Control Panel to ZERO. Wait 15 seconds. Set OPTICS SPEED to LO. Set OPTICS ZERO to OFF.

6.2.13.5.5 Start tape reader (KST-00201).

6.2.13.5.6 Wait approximately 35 seconds after tape reader stops for R1 = 00001. When R1 = 00001 start tape reader.

6.2.13.5.7 When tape reader stops, record contents of R1, R2 and R3. R1 is run number. R2 (Trunnion S.F.) shall be between 00221 and 00271. R3 (Shaft S.F.) shall be between 00447 and 00567.

6.2.13.5.8 Start tape reader (KST-00203).

6.2.13.5.9 Wait approximately 35 seconds after tape reader stops for R1 = 00002. When R1 = 00002, start tape reader.

6.2.13.5.10 When tape reader stops record contents of R1, R2 and R3. R1 is run number. R2 (Trunnion S. F.) shall be between 00221 and 00271. R3 (Shaft S. F.) shall be between 00447 and 00567.

6.2.13.5.11 Start tape reader (KST-00205).

6.2.13.5.12 Wait approximately 5 seconds after tape reader stops for R1 = 00003. When R1 = 00003, start tape reader.

6.2.13.5.13 When tape reader stops, record contents of R1, R2 and R3. R1 is run number. R2 (Trunnion S. F.) shall be between 00221 and 00271. R3 (Shaft S. F.) shall be between 00447 and 00567.

6.2.13.5.14 Start tape reader (KST-00207).

6.2.13.5.15 Wait approximately 5 seconds after tape reader stops for R1 = 00004. When R1 = 00004, start tape reader.

6.2.13.5.16 When tape reader stops, record contents of R1, R2 and R3. R1 is run number. R2 (Trunnion S. F.) shall be between 00221 and 00271. R3 (Shaft S. F.) shall be between 00447 and 00567.

6.2.13.5.17 Start tape reader (KST-00211).

6.2.13.5.18 Wait approximately 15 seconds after tape reader stops for R1 = 00005. When R1 = 00005, start tape reader.

6.2.13.5.19 When tape reader stops, record contents of R1, R2 and R3. R1 is run number. R2 (Trunnion S. F.) shall be between 00221 and 00271. R3 (Shaft S. F.) shall be between 00447 and 00567.

6.2.13.5.20 Start tape reader (KST-00213).

6.2.13.5.21 Wait approximately 15 seconds after tape reader stops for R1 = 00006. When R1 = 00006, start tape reader.

6.2.13.5.22 When tape reader stops, record contents of R1, R2 and R3. R1 is run number. R2 (Trunnion S. F.) shall be between 00221 and 00271. R3 (Shaft S. F.) shall be between 00447 and 00567.

6.2.13.5.23 Start tape reader. When tape reader stops, verify R1 = 00215. Test is terminated.

6.2.13.5.24 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +5 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO.

6.2.14 Stabilization Loop Step Response Test

6.2.14.1 Proceed with this test if the Operate Power On Test of 6.2.3 has been performed and system operation has not been interrupted. If system operation has been interrupted, perform the Turn On Procedure of 6.2.5.2 before proceeding.

6.2.14.2 Insure that the Carry-on Command Stimuli Unit, Model No. C14-200, is installed and connected.

6.2.14.3 Enter VERB 36 into K148. Press the ENTER pushbutton, then the ERROR RESET pushbutton.

6.2.14.4 Inner Gimbal Response Test.

6.2.14.4.1 Enter code 2032000000 in C-START Module. Press the XEQ/SEAL pushbutton to call up CG 2117 IGA SERVO ERROR.

6.2.14.4.2 Enter the following into K148:

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.14.4.3 Wait 15 seconds.

6.2.14.4.4 Enter VERB 40 NOUN 20, ENTER into K148. Wait 15 seconds.

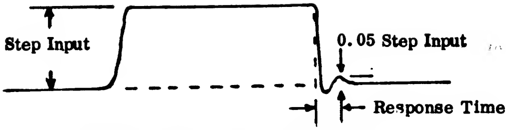
6.2.14.4.5 Deleted.

6.2.14.4.6 Enter 1000 into R155. Verify and execute to enter a DC step into the IG stabilization loop.

CAUTION: If the transient caused by the step input does not settle within 15 seconds, remove the IMU OPERATE power by setting the G/N POWER IMU switch on the LEB Lighting Control Panel to OFF.

6.2.14.4.7 Enter 0000 into R155; the top part of switch should be extinguished. Insure that no other function switches on R155 are illuminated. Start analog recorder. Press the XEQ/SEAL pushbutton to remove the step input to the IG Stabilization Loop. The bottom part of switch shall be extinguished.

6.2.14.4.8 After the transient has settled, stop the analog recorder. Record the loop response time by measuring the time interval between removing the step (initial disturbance) and the settling of the error signal to a value equal to ±5% of the original step amplitude. In addition, record the total number of overshoots. See Figure 2 for typical step input response.



TYPICAL STEP INPUT RESPONSE

FIGURE 2

6.2.14.4.8.1 The inner gimbal stabilization loop response time shall be less than 0.1 second.

6.2.14.4.8.2 The maximum number of overshoots on the IGA Servo Error Signals shall be three.

6.2.14.5 Middle Gimbal Response Test.

6.2.14.5.1 Enter code 2028000000 into C-START MODULE. Press the XEQ/SEAL pushbutton to call up CG 2147 MGA SERVO ERROR.

6.2.14.5.2 Enter the following into K148:

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.14.5.3 Wait 15 seconds.

6.2.14.5.4 Enter VERB 40 NOUN 20 ENTER into K148. Wait 15 seconds.

6.2.14.5.5 Enter 0100 into R155. The top part of switch shall be illuminated. Insure that no other function switches on R155 are illuminated.

6.2.14.5.6 Press XEQ/SEAL pushbutton on R155 to enter a DC step into the MG Stabilization Loop.

CAUTION: If the transient caused by the step input does not settle within 15 seconds, remove the IMU OPERATE power by setting the C/N POWER IMU switch on the LEB Lighting Control Panel to OFF.

6.2.14.5.7 Enter 0000 into R155. The top part of the switch shall be extinguished. Insure that no other function switches on R155 are illuminated.
Start analog recorder. Press XEQ/SEAL pushbutton to remove the step inputs to the MG stabilization loop.

6.2.14.5.8 After the transients have settled, stop the analog recorder. Record the loop response time by measuring the time interval between removing the step (initial disturbance) and the settling of the error signal to a value equal to ±5% of the original step amplitude. In addition, record the total number of overshoots.

6.2.14.5.8.1 The middle gimbal stabilization loop response time shall be less than 0.1 second.

6.2.14.5.8.2 The maximum number of overshoots on the MGA Servo Error signals shall be three.

6.2.14.6 Outer Gimbal Response Test.

6.2.14.6.1 Enter code 2026000000 in C-START Module. Press XEQ/SEAL Pushbutton to call up CG 2177 OGA SERVO ERROR.

6.2.14.6.2 Enter the following into K148:

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.14.6.3 Wait 15 seconds.

6.2.14.6.4 Enter VERB 40 NOUN 20, ENTER into K148. Wait 15 seconds.

6.2.14.6.5 Enter 0010 into R155. The top half of the switch shall be illuminated. Insure that no other function switches on R155 are illuminated.

6.2.14.6.6 Press XEQ/SEAL pushbutton on R155 to enter a DC step into the OG Stabilization Loops.

NOTE: If the transient caused by the step input does not settle within 15 seconds, remove the IMU OPERATE power by setting the G/N POWER IMU switch on the LEB Lighting Control Panel to OFF.

6.2.14.6.7 Enter 0000 into R155. The top half of the switch shall be extinguished. Insure that no other function switches on R155 are illuminated. Start analog recorder. Press the XEQ/SEAL pushbutton to remove the step input to the OG Stabilization Loop.

6.2.14.6.8 After the transients have settled out, stop the analog recorder. Record the loop response time by measuring the time interval between removing the step (initial disturbance) and the settling of the error signal to a value equal to ±5% of the original step amplitude. In addition, record the total number of overshoots.

6.2.14.6.8.1 The outer gimbal stabilization loop response time shall be less than 0.1 second.

6.2.14.6.8.2 The maximum number of overshoots on the OGA Servo Error Signals shall be five.

6.2.14.7 Enter VERB 40 NOUN 20 into K148. Press the ENTER pushbutton. Wait 15 seconds.

6.2.14.7.1 Enter the following into K148:

```
VERB 41 NOUN 20 ENTER
+00000          ENTER
+00000          ENTER
+00000          ENTER
```

6.2.14.7.2 Deleted.

6.2.15 IRIG Scale Factor Test

6.2.15.1 Verify the appropriate K-START tape for IRIG Scale Factor Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.15.2 Start tape reader.

6.2.15.2.1 When tape reader stops verify the following on the CRT DSKY display:

a. R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
b. R2 = +00083 (tape number)
c. R3 = -YYYZX (X is the tape revision number, YYY is the spacecraft number when assigned, and Z is the revision to the rope revision number and has meaning for tapes in Section B of Appendix II).

6.2.15.2.2 Start tape reader.

6.2.15.2.3 When tape reader stops, wait 20 seconds.

6.2.15.3 E-Memory Program Load.

6.2.15.3.1 Start tape reader.

6.2.15.3.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00000.

6.2.15.4 Test Position Data Load (+X Scale Factor)

6.2.15.4.1 Start tape reader.

6.2.15.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.2.15.4.3 Start tape reader.

6.2.15.4.4 When tape reader stops, VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nave Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.4.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.4.6 In approximately 120 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001).

6.2.15.5 Test Position Data Load (+Y Scale Factor)

6.2.15.5.1 Start tape reader.

6.2.15.5.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.2.15.5.3 Start tape reader.

6.2.15.5.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.5.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.5.6 In approximately 120 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.2.15.6 Test Position Data Load (+Z Scale Factor).

6.2.15.6.1 Start tape reader.

6.2.15.6.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.2.15.6.3 Start tape reader.

6.2.15.6.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.6.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.6.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.2.15.7 Test Position Data Load (-X Scale Factor)

6.2.15.7.1 Start tape reader.

6.2.15.7.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.2.15.7.3 Start tape reader.

6.2.15.7.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.7.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.7.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.2.15.8 Test Position Data Load (-Y Scale Factor)

6.2.15.8.1 Start tape reader.

6.2.15.8.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.2.15.8.3 Start tape reader.

6.2.15.8.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTER into K-148 and enter correct azimuth.

6.2.15.8.4 (continued) If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.8.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.8.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.2.15.9 Test Position Data Load (-Z Scale Factor)

6.2.15.9.1 Start tape reader.

6.2.15.9.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.2.15.9.3 Start tape reader.

6.2.15.9.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.9.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.9.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.2.15.10 Test Position Data Load (+X Scale Factor)

6.2.15.10.1 Start tape reader.

6.2.15.10.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.2.15.10.3 Start tape reader.

6.2.15.10.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.10.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.10.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.2.15.11 Test Position Data Load (+Y Scale Factor)

6.2.15.11.1 Start tape reader.

6.2.15.11.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.2.15.11.3 Start tape reader.

6.2.15.11.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.11.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.11.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.2.15.12 Test Position Data Load (+Z Scale Factor)

6.2.15.12.1 Start tape reader.

6.2.15.12.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.2.15.12.3 Start tape reader.

6.2.15.12.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.12.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.12.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.2.15.13 Test Position Data Load (-X Scale Factor)

6.2.15.13.1 Start tape reader.

6.2.15.13.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.2.15.13.3 Start tape reader.

6.2.15.13.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.13.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.13.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.2.15.14 Test Position Data Load (-Y Scale Factor)

6.2.15.14.1 Start tape reader.

6.2.15.14.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.2.15.14.3 Start tape reader.

6.2.15.14.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.14.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.14.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.2.15.15 Test Position Data Load (-Z Scale Factor)

6.2.15.15.1 Start tape reader.

6.2.15.15.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.2.15.15.3 Start tape reader.

6.2.15.15.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

6.2.15.15.4 (continued) If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.15.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.15.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.2.15.16 Test Position Data Load (+X Scale Factor)

6.2.15.16.1 Start tape reader.

6.2.15.16.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00001.

6.2.15.16.3 Start tape reader.

6.2.15.16.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.16.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.16.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.2.15.17 Test Position Data Load (+Y Scale Factor)

6.2.15.17.1 Start tape reader.

6.2.15.17.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.2.15.17.3 Start tape reader.

6.2.15.17.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.17.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.17.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.2.15.18 Test Position Data Load (+Z Scale Factor)

6.2.15.18.1 Start tape reader.

6.2.15.18.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.2.15.18.3 Start tape reader.

6.2.15.18.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.18.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.18.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.2.15.19 Test Position Data Load (-X Scale Factor)

6.2.15.19.1 Start tape reader.

6.2.15.19.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.2.15.19.3 Start tape reader.

6.2.15.19.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.19.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.19.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.2.15.20 Test Position Data Load (-Y Scale Factor)

6.2.15.20.1 Start tape reader.

6.2.15.20.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.2.15.20.3 Start tape reader.

6.2.15.20.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.20.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.20.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.2.15.21 Test Position Data Load (-Z Scale Factor)

6.2.15.21.1 Start tape reader.

6.2.15.21.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.2.15.21.3 Start tape reader.

6.2.15.21.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.21.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.21.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.2.15.22 Test Position Data Load (+X Scale Factor)

6.2.15.22.1 Start tape reader.

6.2.15.22.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00001.

6.2.15.22.3 Start tape reader.

6.2.15.22.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

6.2.15.22.4 (continued) If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.22.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.22.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.2.15.23 Test Position Data Load (+Y Scale Factor)

6.2.15.23.1 Start tape reader.

6.2.15.23.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.2.15.23.3 Start tape reader.

6.2.15.23.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.23.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.23.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.2.15.24 Test Position Data Load (+Z Scale Factor)

6.2.15.24.1 Start tape reader.

6.2.15.24.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.2.15.24.3 Start tape reader.

6.2.15.24.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.24.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.24.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.2.15.25 Test Position Data Load (-X Scale Factor)

6.2.15.25.1 Start tape reader.

6.2.15.25.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.2.15.25.3 Start tape reader.

6.2.15.25.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.25.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.25.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.2.15.26 Test Position Data Load (-Y Scale Factor)

6.2.15.26.1 Start tape reader.

6.2.15.26.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.2.15.26.3 Start tape reader.

6.2.15.26.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.26.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.26.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.2.15.27 Test Position Data Load (-Z Scale Factor)

6.2.15.27.1 Start tape reader.

6.2.15.27.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.2.15.27.3 Start tape reader.

6.2.15.27.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.27.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.27.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.2.15.28 Terminate this test by entering the following into K-148:

VERB 36 ENTR Wait 10 seconds.
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.2.15.29 The four-run average Scale Factor Error for each of the six positions shall be 0 plus or minus 1750 ppm.

6.2.16 IMU Performance Test. A reference data sheet is provided at the end of this section to aid in data reduction.

6.2.16.1 Insure that IMU Operate power and LGC Operate power has been supplied for a minimum of one hour and that the IMU is not in a Gimbal Lock condition.

6.2.16.2 On CRT, monitor and record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.2.16.3 Verify the appropriate K-START tape for IMU Performance Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.16.4 Start tape reader.

6.2.16.4.1 When tape reader stops, verify the following on the CRT DSKY display:

a. R1 = YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
b. R2 = +00081 (tape number)
c. R3 = -YYYZX (X is the tape revision number, YYY is the spacecraft number when assigned, and Z is the revision to the rope revision number and has meaning for tapes in Section B of Appendix II).

6.2.16.4.2 Start tape reader.

6.2.16.4.3 When tape reader stops, wait 15 seconds.

6.2.16.5 Start the tape reader. After 15 seconds, verify IMU is coarse aligned to zero degrees.

6.2.16.6 E-Memory Program Load.

6.2.16.6.1 Start the tape reader. When tape reader stops, verify the following DSKY display:

Row 1
Row 3

6.2.16.7 Test Position +00001.

6.2.16.7.1 E-Memory Program and Test Position Matrix Sum Check

6.2.16.7.1.1 Start tape reader.

6.2.16.7.1.2 When tape reader stops, verify DSKY Row 1 displays +00001.

6.2.16.7.2 Start tape reader.

6.2.16.7.2.1 When tape reader stops wait 20 seconds.

6.2.16.7.3 Test Initialization.

6.2.16.7.3.1 Start tape reader.

6.2.16.7.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.7.4 Horizontal Drift Test

6.2.16.7.4.1 Start tape reader.

6.2.16.7.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.7.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.7.5 Test Termination.

6.2.16.7.5.1 Start tape reader.

6.2.16.7.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.8 Test Position +00002.

6.2.16.8.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.8.1.1 Start tape reader.

6.2.16.8.1.2 When tape reader stops, verify DSKY Row 1 displays +00002.

6.2.16.8.2 Start tape reader.

6.2.16.8.2.1 When tape reader stops, wait 20 seconds.

6.2.16.8.3 Test Initialization.

6.2.16.8.3.1 Start tape reader.

6.2.16.8.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.8.4 Horizontal Drift Test.

6.2.16.8.4.1 Start tape reader.

6.2.16.8.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.8.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.8.5 PIPA Scale Factor Test.

6.2.16.8.5.1 Start tape reader.

6.2.16.8.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.2.16.8.6 Vertical Drift Test.

6.2.16.8.6.1 Start tape reader.

6.2.16.8.6.2 In approximately 67 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.2.16.8.7 Test Termination.

6.2.16.8.7.1 Start tape reader.

6.2.16.8.7.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.9 Test Position +00003.

6.2.16.9.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.9.1.1 Start tape reader.

6.2.16.9.1.2 When tape reader stops, verify DSKY Row 1 displays +00003.

6.2.16.9.2 Start tape reader.

6.2.16.9.2.1 When tape reader stops, wait 20 seconds.

6.2.16.9.3 Test Initialization.

6.2.16.9.3.1 Start tape reader.

6.2.16.9.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.9.4 Horizontal Drift Test

6.2.16.9.4.1 Start tape reader.

6.2.16.9.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.9.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.9.5 Test Termination.

6.2.16.9.5.1 Start tape reader.

6.2.16.9.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.10 Test Position +00004.

6.2.16.10.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.10.1.1 Start tape reader.

6.2.16.10.1.2 When tape reader stops, verify DSKY Row 1 displays +00004.

6.2.16.10.2 Start tape reader.

6.2.16.10.2.1 When tape reader stops, wait 20 seconds.

6.2.16.10.3 Test Initialization.

6.2.16.10.3.1 Start tape reader.

6.2.16.10.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.10.4 Horizontal Drift Test.

6.2.16.10.4.1 Start tape reader.

6.2.16.10.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.10.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.2.16.10.5 PIPA Scale Factor Test.

6.2.16.10.5.1 Start tape reader.

6.2.16.10.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.2.16.10.6 Vertical Drift Test.

6.2.16.10.6.1 Start tape reader.

6.2.16.10.6.2 In approximately 67 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.2.16.10.7 Test Termination.

6.2.16.10.7.1 Start tape reader.

6.2.16.10.7.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.11 Test Position +00005.

6.2.16.11.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.11.1.1 Start tape reader.

6.2.16.11.1.2 When tape reader stops, verify DSKY Row 1 displays +00005.

6.2.16.11.2 Start tape reader.

6.2.16.11.2.1 When tape reader stops, wait 20 seconds.

6.2.16.11.3 Test Initialization.

6.2.16.11.3.1 Start tape reader.

6.2.16.11.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.11.4 PIPA Scale Factor Test

6.2.16.11.4.1 Start tape reader. Record time.

6.2.16.11.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM and GIMBAL LOCK lamps shall be lit.

6.2.16.11.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.2.16.11.5 Test Termination.

6.2.16.11.5.1 Start tape reader.

6.2.16.11.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.12 Test Position +00006.

6.2.16.12.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.12.1.1 Start tape reader.

6.2.16.12.1.2 When tape reader stops, verify DSKY Row 1 displays +00006.

6.2.16.12.2 Start tape reader.

6.2.16.12.2.1 When tape reader stops, wait 20 seconds.

6.2.16.12.3 Test Initialization.

6.2.16.12.3.1 Start tape reader.

6.2.16.12.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.12.4 PIPA Scale Factor Test.

6.2.16.12.4.1 Start tape reader. Record time.

6.2.16.12.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM and GIMBAL LOCK lamps shall be lit.

6.2.16.12.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.2.16.12.5 Test Termination.

6.2.16.12.5.1 Start tape reader.

6.2.16.12.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.13 Test Position +00007.

6.2.16.13.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.13.1.1 Start tape reader.

6.2.16.13.1.2 When tape reader stops verify DSKY Row 1 displays +00007.

6.2.16.13.2 Start tape reader.

6.2.16.13.2.1 When tape reader stops, wait 20 seconds.

6.2.16.13.3 Test Initialization.

6.2.16.13.3.1 Start tape reader.

6.2.16.13.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.13.4 Horizontal Drift Test.

6.2.16.13.4.1 Start tape reader.

6.2.16.13.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.13.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.2.16.13.5 Test Termination.

6.2.16.13.5.1 Start tape reader.

6.2.16.13.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.14 Test Position +00008.

6.2.16.14.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.14.1.1 Start tape reader.

6.2.16.14.1.2 When tape reader stops, verify DSKY Row 1 displays +00008.

6.2.16.14.2 Start tape reader.

6.2.16.14.2.1 When tape reader stops, wait 20 seconds.

6.2.16.14.3 Test Initialization.

6.2.16.14.3.1 Start tape reader.

6.2.16.14.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.14.4 Horizontal Drift Test

6.2.16.14.4.1 Start tape reader.

6.2.16.14.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish

6.2.16.14.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.14.5 Test Termination.

6.2.16.14.5.1 Start tape reader.

6.2.16.14.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.15. Test Position +00009.

6.2.16.15.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.15.1.1 Start tape reader.

6.2.16.15.1.2 When tape reader stops, verify DSKY Row 1 displays +00009.

6.2.16.15.2 Start tape reader.

6.2.16.15.2.1 When tape reader stops, wait 20 seconds.

6.2.16.15.3 Test Initialization.

6.2.16.15.3.1 Start tape reader.

6.2.16.15.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.15.4 Horizontal Drift Test.

6.2.16.15.4.1 Start tape reader.

6.2.16.15.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.15.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.15.5 Test Termination

6.2.16.15.5.1 Start tape reader.

6.2.16.15.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.16 Test Position +00010.

6.2.16.16.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.16.1.1 Start tape reader.

6.2.16.16.1.2 When tape reader stops, verify DSKY Row 1 displays +00010.

6.2.16.16.2 Start tape reader.

6.2.16.16.2.1 When tape reader stops, wait 20 seconds.

6.2.16.16.3 Test Initialization.

6.2.16.16.3.1 Start tape reader.

6.2.16.16.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.16.4 Horizontal Drift Test.

6.2.16.16.4.1 Start tape reader.

6.2.16.16.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.16.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.16.5 Test Termination.

6.2.16.16.5.1 Start tape reader.

6.2.16.16.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.17 Test Position +00011.

6.2.16.17.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.17.1.1 Start tape reader.

6.2.16.17.1.2 When tape reader stops, verify DSKY Row 1 displays +00011.

6.2.16.17.2 Start tape reader.

6.2.16.17.2.1 When tape reader stops, wait 20 seconds.

6.2.16.17.3 Test Initialization.

6.2.16.17.3.1 Start tape reader.

6.2.16.17.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.17.4 Horizontal Drift Test.

6.2.16.17.4.1 Start tape reader.

6.2.16.17.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.17.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.17.5 PIPA Scale Factor Test.

6.2.16.17.5.1 Start tape reader.

6.2.16.17.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.2.16.17.6 Test Termination.

6.2.16.17.6.1 Start tape reader.

6.2.16.17.6.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.18 Test Position +00012.

6.2.16.18.1 E-Memory Program and Test Position Matrix Sum Check

6.2.16.18.1.1 Start tape reader.

6.2.16.18.1.2 When tape reader stops, verify DSKY Row 1 displays +00012.

6.2.16.18.2 Start tape reader.

6.2.16.18.2.1 When tape reader stops, wait 20 seconds.

6.2.16.18.3 Test Initialization.

6.2.16.18.3.1 Start tape reader.

6.2.16.18.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

6.2.16.18.3.2 (continued) If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24 ENTR
XXX.XX (Correct Nav Base Azimuth ±0.5 deg)
XX.XXX (Correct Site Latitude)

6.2.16.18.4 Horizontal Drift Test.

6.2.16.18.4.1 Start tape reader.

6.2.16.18.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.18.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.18.5 PIPA Scale Factor Test.

6.2.16.18.5.1 Start tape reader.

6.2.16.18.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXX. and .XXXXX cm/sec/sec).

6.2.16.18.6 Test Termination.

6.2.16.18.6.1 Start tape reader.

6.2.16.18.6.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.19 Test Position +00013.

6.2.16.19.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.19.1.1 Start tape reader.

6.2.16.19.1.2 When tape reader stops, verify DSKY Row 1 displays +00013.

6.2.16.19.2 Start tape reader.

6.2.16.19.2.1 When tape reader stops, wait 20 seconds.

6.2.16.19.3 Test Initialization.

6.2.16.19.3.1 Start tape reader.

6.2.16.19.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.19.4 Horizontal Drift Test.

6.2.16.19.4.1 Start tape reader.

6.2.16.19.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.19.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.19.5 Test Termination.

6.2.16.19.5.1 Start tape reader.

6.2.16.19.5.2 When tape reader stops, wait 15 seconds before continuing.

6.2.16.20 On CRT, record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.2.16.21 Start Tape Reader.

6.2.16.22 Calculations.

NOTE: Use Post Vibration or System Test data points only.

6.2.16.22.1 **Y PIPA Data Correction Calculation.**

6.2.16.22.1.1 From the uplink file tape, the compressed data tape or the PCM tape, request a data reduction of the X and Z accelerometer ΔV counts (addresses 37 and 41, respectively) and the TIME 2 and TIME 1 registers (addresses 24 and 25, respectively) for the period during which the Y PIPA test was being performed in Positions 5 and 6 of the IMU Performance Test.

6.2.16.22.1.2 Perform the following calculations for Position 5.

$$G'_5 = (G_5/\text{Cos } \theta y_5)$$

where:

G_5 = Measured acceleration term (line 1)

G'_5 = Corrected acceleration term

$\text{Cos } \theta y_5 = 1 - (\theta^2 y_5/2)$ for small angles

$$\theta y_5 = \sqrt{\theta^2{}_{x5} + \theta^2{}_{z5}}$$

and:

$$\theta_{z5} = (\Delta V_{x5} - \Delta V_x \text{ Bias})(\text{S.F.}_x)/(\Delta T)(\text{local g})$$

$$\theta_{x5} = (\Delta V_{z5} - \Delta V_z \text{ Bias})(\text{S.F.}_z)/(\Delta T)(\text{local g})$$

and:

$$\Delta V_x \text{ Bias} = (\text{X PIPA Bias})(\Delta T)/\text{S.F.}_x$$

$$\Delta V_z \text{ Bias} = (\text{Z PIPA Bias})(\Delta T)/\text{S.F.}_z$$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.2.16.22.1.3 Perform the following calculations for Position 6.

$G'_6 = (G_6/\text{Cos } \theta y_6)$

where:

G_6 = Measured acceleration term (line j)

G'_6 = Corrected acceleration term

$\text{Cos } \theta y_6 = 1 - (\theta^2 y_6/2)$ for small angles

$\theta y_6 = \sqrt{\theta^2{}_{x6} + \theta^2{}_{z6}}$

and:

$\theta_{z6} = (\Delta V_{x6} - \Delta V_x \text{ Bias}) (\text{S.F.}_x) / (\Delta T) (\text{local g})$

$\theta_{x6} = (\Delta V_{z6} - \Delta V_z \text{ Bias}) (\text{S.F.}_z) / (\Delta T) (\text{local g})$

and:

$\Delta V_x \text{ Bias} = (\text{X PIPA Bias}) (\Delta T)/\text{S.F.}_x$

$\Delta V_z \text{ Bias} = (\text{Z PIPA Bias}) (\Delta T)/\text{S.F.}_z$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.2.16.22.2 Obtain data from last IRIG and/or PIPA Test and fill in Data Sheet x_{i-1}.

6.2.16.22.3 Obtain data from second last IRIG and/or PIPA Test and fill in Data Sheet x_{i-2}.

6.2.16.22.4 Obtain data from third last IRIG and/or PIPA Test and fill in Data Sheet x_{i-3}.

6.2.16.22.5 Perform the following calculations for each item appearing on Data Sheet x_i.

NOTE: See Paragraph 5.5 before continuing.

$$D_1 = \left| x_{i-1} - x_i \right|$$

$$D_2 = \left| x_{i-1} - x_i \right| + \left| x_{i-2} - x_{i-1} \right|$$

$$D_3 = \left| x_{i-3} - x_{i-2} \right| + \left| x_{i-2} - x_{i-1} \right| + \left| x_{i-1} - x_i \right|$$

DATA SHEET

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.2.16. 7.4.3	+N BDY - ADOAY Position +00001	meru/g	( )___·__	a
6.2.16. 8.4.3	+N BDZ - ADOAZ Position +00002	meru/g	( )___·__	b
6.2.16.. 8.5.2	-X PIPA Test Position +00002	cm/sec^2	( ) 0 0___· ( )_____	c
6.2.16. 8.6.2	-N BDX + ADIAX Position +00002	meru/g	( )___·__	d
6.2.16. 9.4.3	+N BDX - ADOAX Position +00003	meru/g	( )___·__	e
6.2.16. 10.4.3	+N BDY + ADSRAY Position +00004	meru/g	( )___·__	f
6.2.16. 10.5.2	-Z PIPA Test Position +00004	cm/sec^2	( ) 0 0 ___· ( )_____	g
6.2.16. 10.6.2	+N BDZ + ADIAZ Position +00004	meru/g	( )___·__	h
6.2.16 11.4.3	+Y PIPA Test Position +00005	cm/sec^2	( ) 0 0 ___· ( )_____	i

DATA SHEET (continued)

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.2.16. 12.4.3	-Y PIPA Test Position +00006	cm/sec^2	( ) 0 0 ___ • ( ) _____	j
6.2.16 13.4.3	-NBDX + .707 (ADSRAX - ADOAX) Position +00007	meru/g	( ) ___ • __	k
6.2.16. 14.4.3	-.707 (NBDZ+NBDY) +0.5 (ADIAZ-ADIAY) +0.5 (ADSRAY + ADSRAZ) Position +00008	meru/g	( ) ___ • __	l
6.2.16. 15.4.3	-NBDZ + .707 (ADSRAZ-ADOAZ) Position +00009	meru/g	( ) ___ • __	m
6.2.16 16.4.3	.707 (NBDY-NBDX) +0.5 (ADIAY-ADIAX) +0.5 (ADSRAX) + 0.5 (ADOAY) Position +00010	meru/g	( ) ___ • __	n
6.2.16 17.4.3	-NDBX - ADOAX Position +00011	meru/g	( ) ___ • __	o
6.2.16. 17.5.2	+Z PIPA Test Position +00011	cm/sec^2	( ) 0 0 ___ • ( ) _____	p
6.2.16. 18.4.3	+NBDY+ ADOAY Position +00012	meru/g	( ) ___ • __	q
6.2.16. 18.5.2	+X PIPA Test Position +00012	cm/sec^2	( ) 0 0 ___ • ( ) _____	r
6.2.16. 19.4.3	+NBDZ+ ADOAZ Position +00013	meru/g	( ) ___ • __	s

DATA SHEET

CALCULATION	PARAMETER	UNITS	
$\frac{\text{line a + line q}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDY - ADOAY + NBDY + ADOAY}}{2}$ Transfer result to line ao	NBDY	meru	t
$\frac{\text{line q - line a}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDY + ADOAY - (NBDY - ADOAY)}}{2}$	ADOAY	meru/g	u
$\frac{\text{line b + line s}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDZ - ADOAZ + NBDZ + ADOAZ}}{2}$ Transfer result to line ap	NBDZ	meru	v
$\frac{\text{line s - line b}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDZ + ADOAZ - (NBDZ - ADOAZ)}}{2}$	ADOAZ	meru/g	w
$\frac{\text{line e - line o}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDX - ADOAX - (-NBDX - ADOAX)}}{2}$ Transfer result to line aq	NBDX	meru	x
$\frac{\text{line e + line o}}{2} \text{ x } (-1) = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDX - ADOAX - NBDX - ADOAX}}{2} \text{ x } (-1)$	ADOAX	meru/g	y

DATA SHEET (continued)

CALCULATION	PARAMETER	UNITS	
line d + line x = ( )___.__ (-NBDX + ADIAX) + NBDX Transfer result to line au	ADIAX	meru/g	z
line f - line t = ( )___.__ (+NBDY + ADSRAY) - NBDY Transfer result to line ar	ADSRAY	meru/g	aa
line h - line v = ( )___.__ (+NBDZ + ADIAZ) - NBDZ Transfer result to line av	ADIAZ	meru/g	ab
[line k + line x + .707 line y] x 1.414 [-NBDX + .707 ADSRAX -.707 ADOAX + NBDX + .707 ADOAX] x 1.414 Transfer results to line at	ADSRAX	meru/g	ac
(line m + line v + line w) x 1.414 [-NBDZ + .707(ADSRAZ-ADOAZ) + NBDZ + .707 ADOAZ] x 1.414 Transfer results to line as	ADSRAZ	meru/g	ad
(line n - .707 line t + .707 line x + 0.5 line z - 0.5 line ac - 0.5 line u) x 2 [.707(NBDY-NBDX) + 0.5(ADIAY-ADIAX) +0.5 ADSRAX + 0.5 ADOAY -.707 NBDY + .707 NBDX + 0.5 ADIAX -0.5 ADSRAX - 0.5 ADOAY] x 2 Transfer results to line aw.	ADIAY	meru/g	ae
line r - line c = ( )	PIPA X2G	cm/sec^2	af
line i - line j = ( )	PIPA Y2G	cm/sec^2	ag
line p - line g = ( )	PIPA Z2G	cm/sec^2	ah

DATA SHEET (continued)

CALCULATION	PARAMETER	UNITS	
1958.48 — line af x 1 cm/sec pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ax.	X PIPA S.F.	cm/sec/ pulse	ai
1958.48 — line ag x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ay.	Y PIPA S.F.	cm/sec/ pulse	aj
1958.48 — line ah x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer to line az.	Z PIPA S.F.	cm/sec pulse	ak
1/2 (line r + line c) = ( ) __ · ___ Transfer results to line ba.	X PIPA Bias	cm/sec^2	al
1/2 (line i + line j) = ( ) __ · ___ Transfer results to line bb.	Y PIPA Bias	cm/sec^2	am
1/2 (line p + line g) = ( ) __ · ___ Transfer results to line bc.	Z PIPA Bias	cm/sec^2	an

DATA SHEET (x_i)

PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
NBDY	meru	-15		+15			ao
NBDZ	meru	-15		+15			ap
NBDX	meru	-15		+15			aq
ADSRAY	meru/g	-40		+40			ar
ADSRAZ	meru/g	-40		+40			as
ADSRAX	meru/g	-40		+40			at
ADIAX	meru/g	-100		+100			au
ADIAZ	meru/g	-100		+100			av
ADIAY	meru/g	-100		+100			aw
X PIPA S.F.error from line ai	PPM	-1900		+1900			ax
Y PIPA S.F.error from line aj	PPM	-1900		+1900			ay
Z PIPA S.F.error from line ak	PPM	-1900		+1900			az
X PIPA Bias from line al	cm/sec^2	-3.1		+3.1			ba
Y PIPA Bias from line am	cm/sec^2	-3.1		+3.1			bb
Z PIPA Bias from line an	cm/sec^2	-3.1		+3.1			bc

DATA SHEET

PARAMETER	UNITS	D_1	MAX	D_2	MAX	D_3	MAX
NBDY	meru		6.0		9.0		11.0
NBDZ	meru		6.0		9.0		11.0
NBDX	meru		6.0		9.0		11.0
ADSRAY	meru/g		14.0		21.0		25.0
ADSRAZ	meru/g		14.0		21.0		25.0
ADSRAX	meru/g		14.0		21.0		25.0
ADIAX	meru/g		17.0		33.0		40.0
ADIAZ	meru/g		17.0		33.0		40.0
ADIAY	meru/g		17.0		33.0		40.0
X PIPA S.F. error	PPM		400		500		600
Y PIPA S.F. error	PPM		400		500		600
Z PIPA S.F. error	PPM		400		500		600
X PIPA Bias	cm/sec^2		0.50		0.70		0.90
Y PIPA Bias	cm/sec^2		0.50		0.70		0.90
Z PIPA Bias	cm/sec^2		0.50		0.70		0.90

DATA SHEET (x_{1-1})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET (x_1-2)

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET (x_{1-3})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S.F. error	PPM	
Y PIPA S.F. error	PPM	
Z PIPA S.F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

6.2.17 SXT-NB-IMU Fine Align Test (see Table III, Section 5)

6.2.18 Gyro Compassing Test

6.2.18.1 Set the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify that +28 vdc OPTICS OPERATE BUS (CG 1530) is +28.0±3.0 vdc. Verify that the OPTX 28V 800 cps 1% 0° (CG 1211) and OPTX 28V 800 cps 5% -90° (CG 1212) are not flashing in the CRT.

6.2.18.2 Enter the following into the CMC:

VERB 37 ENTER 01 ENTER

6.2.18.3 When PROG display changes to 02, record time as T_0.

6.2.18.4 Gyro Compassing Accuracy

6.2.18.4.1 Wait 120 minutes from T_0. Record Inner, Middle and Outer Gimbal CDU readings every 5 minutes for the next 2 hours.

6.2.18.4.2 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO.

6.2.18.4.3 Enter VERB 65, ENTER into DSKY.
Observe the PROG display on the DSKY change to 03.

6.2.18.4.4 When VERB 06 NOUN 41 flashes on the DSKY, insure R1 and R2 display Target 1 azimuth and elevation.

a. R1 = +XXX.XX (Target 1 azimuth)
b. R2 = +XX.XXX (Target 1 elevation)
c. R3 = 00001

6.2.18.4.5 Verify the data appearing in R1 and R2 and if correct, proceed. If not correct, perform the following sequence:

a. VERB 24, ENTER
b. +XXX.XX, ENTER (Target 1 azimuth)
c. ±XX.XXX, ENTER (Target 1 elevation)

6.2.18.4.6 After the correct readings for R1 and R2 are verified, enter VERB 33, ENTER into the DSKY.

6.2.18.4.7 When VERB 06 NOUN 41 flashes on the DSKY, insure that R1 and R2 display Target 2 azimuth and elevation.

a. R1 = XXX.XX (Target 2 azimuth)
b. R2 = XX.XXX (Target 2 elevation)
c. R3 = 00002.

6.2.18.4.8 Verify the data appearing in R1 and R2 and if correct, perform the following sequence:

a. VERB 24, ENTER
b. +XXX.XX, ENTER (Target 2 azimuth)
c. ±XX.XXX, ENTER (Target 2 elevation)

6.2.18.4.9 After the correct readings for R1 and R2 are verified, enter VERB 33, ENTER into the DSKY.

6.2.18.4.10 Set the OPTICS ZERO switch to OFF. Enter VERB 33 ENTER into the DSKY.

6.2.18.4.11 When the DSKY displays V51 flashing and R1 = 00001 set the OPTICS MODE switch on the G&N Indicator Control Panel to CMC. The CMC will align the SXT star LOS to the Target 1 position. When the alignment is complete as observed by no further movement of the Telescope Panel Angle Counters (TPAC) set the OPTICS MODE switch to MANUAL.

6.2.18.4.12 Using the OPTICS Hand Controller and a convenient CONTROLLER SPEED, align the SXT StLOS with Target 1 and press the MARK pushbutton. In approximately 30 seconds VERB 50 NOUN 25 shall flash with R1 = 00016. If satisfied that the MARK was good press the PRO pushbutton. If not satisfied with MARK, press the MARK REJECT pushbutton and repeat this step.

6.2.18.4.13 When the DSKY displays VERB 51 flashing and R1 = 00002 set the OPTICS MODE switch to CMC. The CMC will align the SXT to the Target 2 position. When alignment is complete as observed by no further movement of the TPAC, set the OPTICS MODE switch to MANUAL.

6.2.18.4.14 Using the OPTICS Hand Controller and a convenient CONTROLLER SPEED, align the SXT StLOS with Target 2 and press the MARK pushbutton. In approximately 30 seconds VERB 50 NOUN 25 shall flash and R1 = 00016. If satisfied that the MARK was good press the PRO pushbutton. If not satisfied with the MARK press the MARK REJECT pushbutton and repeat this step.

6.2.18.4.15 On the DSKY, observe the following data displayed:

VERB 06 NOUN 93
R1 = ±XX.XXX (X gyro elevation error, deg)
R2 = ±XX.XXX (Y gyro elevation error, deg)
R3 = ±XX.XXX (Z gyro azimuth error, deg)

Record R1, R2 and R3. The X and Y gyro elevation error shall be 0.00±0.55 degrees and the Z gyro azimuth error shall be 0.00±0.3 degrees. Enter VERB 34 ENTR into the DSKY. Observe PROG display on DSKY change to 02.

6.2.18.4.16 Immediately repeat steps 6.2.18.4.2 through 6.2.18.4.15 twice.

6.2.18.4.17 Repeat steps 6.2.18.4.1 through 6.2.18.4.15 at 150, 180 and 210 minutes from T_0.

6.2.18.4.18 Enter VERB 36 ENTR into the DSKY.

6.2.18.4.19 Enter the following into the DSKY:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

Set the G&N POWER OPTICS switch on the LEB Lighting Control Panel to OFF.

6.2.18.5 Gyro Compassing Stability

6.2.18.5.1 Calculate the average of the first three X and Y gyro elevation errors and the first three Z gyro azimuth errors.

6.2.18.5.2 The last three X and Y gyro elevation errors shall not deviate from the baseline X and Y gyro elevation errors determined above by more than ±0.15 degrees.

6.2.18.5.3 The last three Z gyro azimuth errors shall not deviate from the baseline Z gyro azimuth error determined above by more than ±0.06 degrees.

6.2.19 CMC Voltage Margin Test

6.2.19.1 Verify that the G&N IMU HTR MNA and MNB circuit breaders are engaged. Computer MNA and MNB breakers are engaged, IMU MNA and MNB circuit breakers are not engaged, and the G&N Power-IMU switch on the LEB Lighting Control Panel is in the OFF position.

6.2.19.2 On the PSA Adapter Module (PSAAM), set the INHIBIT VOLTAGE FAIL switch to ON.

6.2.19.3 Rotate the LEB LTS NUMERICS SEL to approximately center position. Decrease the lighting to an absolute discernible minimum.

NOTE: This condition should not be altered throughout the test.

6.2.19.4 On K-148 enter the following:

VERB 36 ENTR

6.2.19.5 Into R-154 insert 0001. Verify and execute.

6.2.19.5.1 Into R-153 insert 1100. Verify and execute.

CAUTION: During the performance of this test, the +4 VDC CMC Power Supply shall not be operated at less than +2.5 vdc or greater than +5.2 vdc (CG 1030). The +14 VDC CMC Power Supply shall not be operated at less than +8.5 vdc or greater than +17.0 vdc (CG 1020).

NOTE: The flashing indication of the CMC Power Supplies on the CRT may be disregarded for this test.

6.2.19.6 Fail Voltage Detector Test

6.2.19.7 On K-148 enter the following sequence:

VERB 21 NOUN 27 ENTR
00010 ENTR

6.2.19.8 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to OFF.

6.2.19.9 Into C-156 insert +000001244. Execute and verify.

6.2.19.9.1 Into R-154 insert 0101. Execute and verify.

6.2.19.9.2 Into C-156 insert +XX.X001244. (The value XX.X shall be slowly increased until a CMC Voltage Fail occurs.) Execute and verify.

6.2.19.10 On the DSKY, verify the RESTART lamp is lit.

6.2.19.10.1 On the G&N panel verify the CMC Warning light is on and the MASTER ALARM light is on.

6.2.19.10.2 Press the MASTER ALARM pushbutton to reset.

6.2.19.11 On PSAAM, set INHIBIT VOLTAGE FAIL switch ON. Verify CHAN 77 display on CRT has Bit 6 on. Other combinations of bits are permissible, but Bit 6 must be on.

6.2.19.12 On the CRT, verify the +14 VDC CMC supply (CG 1020) is between 15.6 and 16.4 vdc. Record.

6.2.19.12.1 Record the final C-START setting.

6.2.19.13 Into R-154 insert 0001. Execute and verify.

6.2.19.14 On K-148 enter the following:

VERB 36 ENTR
press RSET

6.2.19.15 On K-148 enter the following:

VERB 21 NOUN 27 ENTR
00010 ENTR

6.2.19.16 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to OFF.

6.2.19.17 Into C-156 insert -000001244. Execute and verify.

6.2.19.17.1 Into R-154 insert 0101. Execute and verify.

6.2.19.17.2 Into C-156 insert -XX.X001244. (The value XX.X shall be increased, negatively, until a CMC Voltage Fail occurs.) Execute and verify.

6.2.19.18 On the DSKY, verify the RESTART lamp is lit.

6.2.19.18.1 On the G&N panel verify the CMC Warning light is on and the MASTER ALARM light is on.

6.2.19.18.2 Press the MASTER ALARM pushbutton to reset.

6.2.19.19 On PSAAM, set INHIBIT VOLTAGE FAIL switch ON. Verify CHAN 77 display on CRT has Bit 6 on. Other combinations of bits are permissible but Bit 6 must be on.

6.2.19.20 On the CRT, verify the +14 VDC CMC supply (CG 1020) is between 12.1 and 12.8 vdc. Record.

6.2.19.20.1 Record the final C-START setting.

6.2.19.21 Into R-154 insert 0001. Execute and verify.

6.2.19.22 On K-148 enter the following:

VERB 36 ENTR
Press RSET

6.2.19.23 Into C-156 insert +000001244. Execute and verify.

6.2.19.24 On K-148 enter the following:

VERB 21 NOUN 27 ENTR
00010 ENTR

6.2.19.25 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to OFF.

6.2.19.26 Into C-156 insert +000001234. Execute and verify.

6.2.19.26.1 Into R-154 insert 0011. Execute and verify.

6.2.19.26.2 Into C-156 insert +XX.X001234. (The value XX.X shall be slowly increased until a CMC Voltage Fail occurs.) Execute and verify.

6.2.19.27 On the DSKY, verify the RESTART lamp is lit.

6.2.19.27.1 On the G&N panel verify the CMC Warning light is lit and the MASTER ALARM light is on.

6.2.19.27.2 Press the MASTER ALARM pushbutton to reset.

6.2.19.28 On PSAAM, set INHIBIT VOLTAGE FAIL switch ON. Verify CHAN 77 display on CRT has Bit 6 on. Other combinations of bits are permissible but Bit 6 must be on.

6.2.19.29 On the CRT verify the +4 VDC CMC Supply (CG 1030) is between 4.2 and 4.7 vdc. Record.

6.2.19.30 Record the final C-START setting.

6.2.19.31 Into R-154 insert 0001. Execute and verify.

6.2.19.32 On K-148 enter the following:

VERB 36 ENTR
Press RSET

6.2.19.33 On K-148 enter the following:

VERB 21 NOUN 27 ENTR
00010 ENTR

6.2.19.34 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to OFF.

6.2.19.35 Into C-156 insert -000001234. Execute and verify.

6.2.19.35.1 Into R-154 insert 0011. Execute and verify.

6.2.19.35.2 Into C-156 insert -XX.X001234. (The value XX.X shall be increased, negatively, until a CMC Voltage Fail occurs.) Execute and verify.

6.2.19.36 On the DSKY, verify the RESTART lamp is lit.

6.2.19.36.1 On the G&N panel verify the CMC Warning light is on and the MASTER ALARM light is on.

6.2.19.36.2 Press the MASTER ALARM pushbutton to reset.

6.2.19.37 On PSAAM, set INHIBIT VOLTAGE FAIL switch ON. Verify CHANN 77 display on CRT has Bit 6 on. Other combinations of bits are permissible but Bit 6 must be on.

6.2.19.38 On the CRT verify the +4 VDC CMC supply (CG 1030) is between 3.8 and 3.4 vdc. Record.

6.2.19.39 Record the final C-START setting.

6.2.19.40 Into R-154 insert 0001. Execute and verify.

6.2.19.41 On K-148 enter the following:

VERB 36 ENTR
Press RSET

6.2.19.42 Into C-156 insert +000001234. Execute and verify.

6.2.19.43 Voltage Margin Test

6.2.19.44 Verify the appropriate K-START tape for CSM Self-Check Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.19.44.1 Start the tape reader.

APPENDIX II - SECTION B

NEW TAPE NUMBER FORMAT

NAME	NUMBER	PROGRAM	R1	R3
CM Self-Check Test	F11C0720-K10538-X	Colossus IID (Comanche Rev 72)	11072	-YYY0X
CM G/N OPCHK	F11C0720-K10531-X		11072	-YYY0X
CM Semi-Automatic Mode Test	F11C0720-K10530-X		11072	-YYY0X
IRIG Scale Factor Test	F11C0720-K00083-X		11072	-YYY0X
IMU Performance Test	F11C0720-K00081-X		11072	-YYY0X
Alarms and Interrupts Test	F11C0720-K10545-X		11072	-YYY0X
Alms & Int Test/Rstrt Mon	F11C0720-K10550-X		11072	-YYY0X
CM Self Test	F11C1080-K10538-X	Colossus IIE (Comanche Rev 108)	11108	-YYY0X
CM G/N OPCHK	F11C1080-K10531-X		11108	-YYY0X
CM Semi-Automatic Mode Test	F11C1080-K10530-X		11108	-YYY0X
IRIG Scale Factor Test	F11C1080-K00083-X		11108	-YYY0X
Alms & Int Test/Rstrt Mon	F11C1080-K10550-X		11108	-YYY0X
Opt H/C Slew Rate & Rate SF	F11C1080-K10598-X		11108	-YYY0X
IMU Performance Test	F11C1080-K00081-X		11108	-YYY0X

NOTE: X is the tape revision number. YYY is the spacecraft number which is assigned to MIT Mission E-Memory Load Tapes only. The second digit from the right in the R3 display is the revision to the rope revision for which this tape is valid.

6.2.19.45 When the tape reader stops, verify:

R1 = +YYYYY (The value of YYYYY is Flight Rope dependent and is found in Appendix II.)
R2 = +10538 (Tape Number)
R3 = -YYYZX (X is the tape revision number, YYY is the spacecraft number when assigned, and Z is the revision to the rope revision number and has meaning for tapes in Section B of Appendix II).

6.2.19.45.1 Start the tape reader.

6.2.19.46 When the tape reader stops, verify:

R1 = 00101

6.2.19.47 Initiate Self-Check.

6.2.19.47.1 Start the tape reader.

6.2.19.48 When the tape reader stops, record the time. Wait until R2 increments twice.

6.2.19.49 Into R-154 insert 0111. Execute and verify.

6.2.19.50 Into C-156 insert +000001244. Execute and verify.

6.2.19.50.1 Repeatedly insert into C-156 +XX.X001244. (The value XX.X shall be slowly increased until the +14 VDC CMC supply has a value of +16.4 (+0.1, -0.0) vdc.) Execute and verify.

6.2.19.51 Into C-156 insert +000001234. Execute and verify.

6.2.19.51.1 Repeatedly insert into C-156, +XX.X001234. (The value XX.X shall be slowly increased until the +4 VDC CMC supply has a value of +4.5 (+0.1, -0.0) vdc.) Execute and verify.

6.2.19.52 Wait until the R2 display increments twice.

6.2.19.53 Into C-156 insert -000001244. Execute and verify.

6.2.19.53.1 Repeatedly insert into C-156, -XX.X001244. (The value XX.X shall be slowly increased, negatively, until the +14 VDC CMC supply has a value of 12.1 (+0.1, -0.0) vdc.) Execute and verify.

6.2.19.54 Wait until the R2 display increments twice.

6.2.19.55 Into C-156 insert -000001234. Execute and verify.

6.2.19.55.1 Repeatedly insert into C-156, -XX.X001234. (The value XX.X shall be slowly increased, negatively, until +4 VDC CMC supply has a value of 3.4 (+0.1, -0.0) vdc.) Execute and verify.

6.2.19.56 Wait until the R2 display increments twice.

6.2.19.57 Into C-156 insert +000001244. Execute and verify.

6.2.19.57.1 Repeatedly insert into C-156, +XX.X001244. (The value XX.X shall be slowly increased until the +14 VDC CMC supply has a value of +16.4 (+0.1, -0.0) vdc.) Execute and verify.

6.2.19.58 Wait until the R2 display increments twice.

6.2.19.59 Into C-156, insert +000001244. Execute and verify.

6.2.19.60 Into C-156, insert +000001234. Execute and verify.

6.2.19.61 On K-148 enter the following:

VERB 36 ENTR

6.2.19.62 Into R-154, insert 0000. Execute and verify.

6.2.19.63 Into R-153, insert 0000. Execute and verify.

6.2.19.64 On the PSAAM place the INHIBIT VOLTAGE FAIL switch to OFF

ADDENDUM I - Deleted.

APPENDIX I

Signal	Link	Nomenclature	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
CG 1020	1	+14 VDC CMC SUPPLY	+14.0±0.4 VDC	0%
CG 1021	1	+14V CMC SUPPLY NOISE RMS	0.2 VRMS MAX	0%
CG 1030	1	+4 VDC CMC SUPPLY	+4.00±0.2 VDC	0%
CG 1031	1	+4V CMC SUPPLY NOISE RMS	0.2 VRMS MAX	0%
CG 1040	2	+120 VDC PIPA SUPPLY	+120±6.0 VDC	1%
CG 1042	1	+120 VDC PIPA SUP NOISE RMS	1.5 VRMS MAX	0%
CG 1051	1	+20 VDC PIPA SUPPLY	+20.0±1.2 VDC	0%
CG 1052	1	-20 VDC PIPA SUPPLY	-20±2 VDC	0%
CG 1053	1	+20 VDC PIPA SUP NOISE RMS	1.0 VRMS MAX	0%
CG 1070	1	+4 VDC CDU SUPPLY	+4.0±0.2 VDC	0%
CG 1071	1	+4 VDC CDU SUP NOISE RMS	0.1 VRMS MAX	0%
CG 1100	1	-28 VDC SUPPLY	-27.5±6.0 VDC	0%
CG 1110	2	2.5 VDC TM BIAS	+2.50±0.06 VDC	0%
CG 1201	2	IMU 28V .8KC 1% 0° RMS	28.00±0.56VRMS	1%
CG 1202	1	IMU 28V .8KC 5% - 90° RMS	28.0±1.4 VRMS	0.33%
CG 1203	1	IMU 28V .8KC 5% 0° RMS	28.0±2.1 VRMS	0.33%
CG 1207	1	PH DIFF IMU 5% 0°, -90°	-90±10°	2.3%
CG 1211	1	OPTX 28V .8KC 1% 0° RMS	28.00±0.56 VRMS	0.33%
CG 1212	1	OPTX 28V .8KC 5% - 90° RMS	28.00±1.48 VRMS	0.33%
CG 1220	1	PH DIFF OPTX 1% IMU 1%	0° ±10°	2.3%
CG 1331	2	3.2 KC 28V SUPPLY	28.6±0.56 VRMS	1%
CG 1336	1	PH DIFF 3.2 KC 28V/CMC SYNC	0° ±10°	2.3%
CG 1500	1	+28 VDC IMU OPERATE BUS	28.8±3 VDC	0%
CG 1501	1	+28V IMU OPERATE BUS NOISE RMS	1.0 VRMS MAX	0%
CG 1510	1	+28 VDC IMU STANDBY BUS	28.8±3 VDC	0%
CG 1511	1	+28V IMU STANDBY BUS NOISE RMS	1.0 VRMS MAX	0%
CG 1520	1	+28 VDC CMC OPERATE BUS	28.8±3 VDC	0%
CG 1521	1	+28V CMC OPERATE BUS NOISE RMS	2.0 VRMS MAX	0%
CG 1530	1	+28 VDC OPTX OPERATE BUS	28.8±3 VDC	0%
CG 1531	1	+28V OPTX OPERATE BUS NOISE RMS	2.0 VRMS MAX	0%
CG 2001	2	X PIPA SG O/P	5 VRMS max	3%
CG 2021	2	Y PIPA SG O/P	5 VRMS max	0.3%
CG 2041	2	Z PIPA SG O/P	5 VRMS max	3%
CG 2108	1	IG SERVO ERROR QUAD	0.0±1.2 VRMS	3.6%
CG 2112	2	IG 1X RESOLVER O/P SIN	18.38±1.84 VRMS @ 45°	2.5%
CG 2113	2	IG 1X RESOLVER O/P COS	18.38±1.84 VRMS @ 45°	2.5%
CG 2117	2	IG SERVO ERROR IN PHASE	0.0±60 mv RMS @ null	1.4%
CG 2120	1	IG TORQUE MOTOR CURRENT	0.125 amp max during Fine Alignment Torquing	0%

PSAAM OUTPUT is the source of Link 1 signals. SCA OUTPUT is the source of Link 2 signals.

APPENDIX I (Continued)

Signal	Link	Nomenclature	G&N Test Requirements	PSAAM and/or SCA Uncertainty % of Full Scale
CG 2138	1	MG SERVO ERROR QUAD	0.0±1.2 VRMS	3.6%
CG 2142	2	MG 1X RESOLVER O/P SIN	18.38±1.84 VRMS @ 45°	2.5%
CG 2143	2	MG 1X RESOLVER O/P COS	18.38±1.84 VRMS @ 45°	2.5%
CG 2147	2	MG SERVO ERROR IN PHASE	0.0±60 mv rms @ null	1.4%
CG 2150	1	MG TORQUE MOTOR CURRENT	0.125 amp max during Fine Align Torquing	0%
CG 2168	1	OG SERVO ERROR QUAD	0.0±1.2 VRMS	3.6%
CG 2172	2	OG 1X RESOLVER O/P SIN	18.38±1.84 VRMS @ 45°	2.5%
CG 2173	2	OG 1X RESOLVER O/P COS	18.38±1.84 VRMS @ 45°	2.5%
CG 2177	2	OG SERVO ERROR IN PHASE	0.0±60 mv RMS @ null	1.4%
CG 2180	1	OG TORQUE MOTOR CURRENT	0.125 amp max during Fine Align Torquing	0%
CG 2219	1	PITCH ATT ERROR-CDU DAC O/P	5.06±0.5 VRMS @ 17°	0.67%
CG 2220	1	IG CDU FINE ERROR	0.0±0.07 VRMS @ null	0.29%
CG 2221	1	IG CDU COARSE ERROR	0.0±0.68 VRMS at null	0.29%
CG 2249	1	YAW ATT ERROR-CDU DAC O/P	5.06±0.5 VRMS at 17°	0.67%
CG 2250	1	MG CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 2251	1	MG CDU COARSE ERROR	0.0±0.68 VRMS at null	0.29%
CG 2279	1	ROLL ATT ERROR-CDU DAC O/P	5.06±0.5 VRMS at 17°	0.67%
CG 2280	1	OG CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 2281	1	OG CDU COARSE ERROR	0.0±0.68 VRMS	0.29%
CG 2300	2	PIPA TEMPERATURE	130.5±1.5° F Operate Mode	2%
CG 3011	1	TRUNNION CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 3021	1	SHAFT CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 3117	1	SXT SHAFT SERVO ERROR IN PH	-0.25 to -2.00 VRMS at Hi Rate	1.1%
CG 3118	1	SXT TRUNNION SERVO ERROR IN PH	-0.25 to -2.00 VRMS at Hi Rate	1.1%
CG 3140	1	SXT SHAFT TACH O/P	3.3±1.3 VRMS at Hi Rate	1.1%
CG 3145	1	SXT SHAFT MTR CONTROL WINDING	+0.5 to 4.00 VRMS at Med Rate	1.1%
CG 3150	1	SXT TRUNNION TACH O/P	3.3±1.3 VRMS at Hi Rate	1.1%
CG 3155	1	SXT TRUNNION MTR CONTROL WINDING	+0.25 to +2.00 VRMS at Med Rate	1.1%

APPENDIX I (Continued)

Signal	Link	Nomenclature	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
CG 3160	1	SCT SHAFT TACK O/P	3.3± 1.3 VRMS at Hi Rate	1.1%
CG 3170	1	SCT TRUNNION TACH O/P	0.85± 0.35 VRMS at Hi Rate	1.1%
CG 3721	2	SHAFT CDU DAC O/P	10.12± 1.00 VRMS at 17°	1%
CG 3722	2	TRUNNION CDU DAC O/P	10.12± 1.00 VRMS at 17°	1%
CG 4300	1	CMC TEMP	87.5±42.5°F	0.23%
CG 6020	1	PIPA CAL MODULE TEMP	72.5± 27.5°F	0.23%
CG 6021	1	IMU 800 cps 5% TEMP (PSA)	90 30°F	0%

See Page 5

APPENDIX II - SECTION A

K-START TAPE INFORMATION

NAME	NUMBER*	PROGRAM	R1=YYYYY R1 DISPLAY
CM Self-Check Test	F09C104-K10538-XX	COLOSSUS REV 249	09249
CM G/N OPCHK	F09C104-K10531-XX	↓	09249
CM Semi-Automatic Mode Test	F09C104-K10530-XX	↓	09249
IRIG Scale Factor Test	F09C104-K00083-XX	↓	09249
IMU Performance Test	F09C104-K00081-XX	↓	09249
Alarms and Interrupts Test	F09C107-K10545-XX	↓	09249
CM Self-Check Test	F11C106-K10538-XX	COLOSSUS II	11045
CM Self-Check Test	F11C107-K10538-XX	COLOSSUS IIA	11055
CM G/N OPCHK	F11C107-K10531-XX	(COMANCHE REV 55)	11055
CM Semi-Automatic Mode Test	F11C107-K10530-XX	↓	11055
IRIG Scale Factor Test	F11C107-K00083-XX	↓	11055
IMU Performance Test	F11C107-K00081-XX	↓	11055
Alarms and Interrupts Test	F11C107-K10545-XX	↓	11055
CM Self-Check Test	F11C108-K10538-XX	COLOSSUS IIC	11067
CM G/N OPCHK	F11C108-K10531-XX	(COMANCHE REV 67)	11067
CM Semi-Automatic Mode Test	F11C108-K10530-XX	↓	11067
IRIG Scale Factor Test	F11C108-K00083-XX	↓	11067
IMU Performance Test	F11C108-K00081-XX	↓	11067
Alarms and Interrupts Test	F11C108-K10545-XX	↓	11067

*NOTE: Where XX equals the tape revision number.

APOLLO G&N Specification
ND1002379 K
Original Issue Date: 25 July 1968
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Class A **Release**

POST INSTALLATION CHECKOUT PROCESS SPECIFICATION FOR THE APOLLO GUIDANCE & NAVIGATION SYSTEM BLOCK II-KSC WITH COLOSSUS FLIGHT ROPES

Record of Revisions

Date	**Revision Letter**	**TDRR No.**	**Pages Revised**	**Approvals**	
				DE	**NASA**
1/20/70	G	38001	2,21,22,26-28,42,45,54,60-133	EA	MDH
			Was 133 pages, now 142 pages.		
4/2/70	H	38090	17-19, 141, 142	EA	MDH
11/23/70	J	38293	17-142. Was 142 pages, now	EA	MDH
			143 pages. JFO/AC		
2/8/71	K	38348	36-143, was 143 pages now 151	EA	MDH
			pages. JFO/AC		

This specification consists of page 1 to 151 **inclusive.**

APPROVALS	Not Required CCA497-0274 **NASA/MSC**	**MIT/IL**	CCB E. N. Austin 7/25/68	D. A. Ziemer AEA **DE**

6.2.3.1.13 1 hour after the application of IMU OPERATE power monitor and record PIPA TEMP (CG 2300) every 5 minutes for 30 minutes. Verify that each reading does not deviate from the average of each signal by more than 0.1° F.

6.2.3.1.14 When 2 hours have elapsed since the application of IMU OPERATE power record PIPA TEMP. PIPA TEMP shall be 130.5±1.5° F. PIPA TEMP shall be within 0.5° F of that recorded in 6.2.3.1.12 and 6.2.1.3.8.4.

6.2.3.1.15 IMU Heater Current Duty Cycle Determination

NOTE: This test is to be performed once in the MSO and at the PAD during FRT and CDDT.

6.2.3.1.15.1 The following initial conditions must be met before continuing:

(1) The G&N System shall have been in the Operate Mode at least 1.5 hours with the IMU ginbals coarse aligned to zero degress.

(2) The IMU coolant flow rate and coolant temperature shall have been constant for at least one hour prior to taking data.

(3) The 28VDC IMU STANDBY BUS (CG 1510) shall be held constant within ±0.25 VDC for one hour prior to taking data.

6.2.3.1.15.2 Record and identify the following signals as indicated.

	Signal No.	Signal Name	I. D.
a.	CG 1510	28 VDC IMU STANDBY	E_{B+}
b.	CG 1202	IMU 28V 800 CPS, Phase A	E_A
c.	CG 1203	IMU 28V 800 CPS, Phase B	E_B
d.	CF 0157	CM Vehicle Coolant Flow Rate	R
e.	CF 0018	Coolant Temperature	T

6.2.3.1.15.3 Perform the following calculation and identify the result as E_{AB}:

$$\frac{E_A + E_B}{2} = E_{AB}$$

6.2.3.1.15.4 Calculate the Duty Cycle for the IMU HEATER CURRENT (CG 2302) by dividing the time ON for 10 cycles by the total (ON and OFF) time for 10 cycles as indicated on the event recorder. Identify the result as DC_{ACT}.

6.2.3.1.15.5 Normalize the calculated Duty Cycle (DC_{ACT}) for power input as follows:

$$DC_{S/C} = DC_{ACT}\left[0.071\,(E_{B+} + E_{AB}) - 2.976\right]$$

6.2.5.1.3.1 (continued)

VERB 21 NOUN 01 ENTR
01036 ENTR
40000 ENTR

Verify that NO ATT indication is OFF.

6.2.5.1.4 Set the G&N Power AC1-OFF-AC2 Switch on the Right Hand Circuit breaker panel to OFF and the G&N POWER AC1 and AC2 circuit breakers to OFF (breakers pulled out).

6.2.5.1.5 Decrease the LIGHTS - NUMERICS controls on both the Left Hand Circuit Breaker panel and the LEB Lighting Control Panel to the minimum brightness - OFF position.

6.2.5.1.6 Set the PSAAM power switch on the PSAAM to OFF.

6.2.5.1.7 Set the IMU HTR MN A and MN B circuit breaker on the Right Hand Circuit Breaker panel to OFF (breakers pulled out).

6.2.5.1.8 Set the G/N POWER - OPTICS switch on the LEB Lighting Control Panel to OFF and G&N OPTICS MN A and MN B breakers on the Right Hand Circuit breaker panel to OFF.

6.2.5.1.9 Set the COMPUTER MN A and MN B Circuit breakers on the Right Hand Circuit Breaker panel to OFF (breakers pulled out).

6.2.5.1.10 Verify that the PTC is supplying inertial components heater power to the G&N System. This will be indicated by the following on the PTC.

a. G&N ON (PTC inhibit) light not illuminated.
b. IMU Temp/heater current meter indicates IMU temperature of 130° ±5°F.

6.2.5.2 Turn ON Procedure

6.2.5.2.1 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set or verify the following G&N Indicator Control Panel switches to the position indicated.

a. CONDITION LAMPS to ON
b. OPTICS ZERO to ZERO
c. OPTICS MODE to MANUAL
d. OPTICS COUPLING to DIRECT
e. OPTICS SPEED to LO
f. OPTICS TEL TRUN to SLAVE to SXT
g. RETICLE BRIGHTNESS to minimum brightness position.

6.2.5.2.2 Insure that interfacing system EPS and ECS are turned on and operating properly.

CAUTION: The remaining procedure must be followed in sequence specified. Failure to adhere to this sequence may require recalibration of the inertial components.

6.2.5.2.3 Energize the G&N COMPUTER MN A and MN B breakers on the Right Hand Circuit Breaker panel (breakers pushed in). Press the STBY pushbutton on the DSKY for approximately 3 seconds. Verify +14 and +4 VDC AGC power supply outputs on CRT display. Voltages shall be +14±0.4V (CG 1020) and +4±0.2 (CG1030). On DSKY verify TEMP light is ON.

6.2.5.2.4 Set the G&N POWER AC1 and AC2 breakers on the Right Hand Circuit Breaker Panel to ON (breakers pushed in). Set the G&N POWER AC1-OFF-AC2 switch to AC1.

6.2.5.2.4.1 Set the G&N DSKY and Display Panel brightness to the minimum acceptable level by manipulation of LIGHTS - NUMERICS control on both Left Hand Circuit breaker panel and LEB Lighting Control panel.

6.2.5.2.5 Energize the G&N IMU HTR, MN A and MN B breakers on the Right Hand Circuit Breaker panel (breakers pushed in). Insure that the CMC +28 VDC discrete lamp on the Event Module is illuminated (CG 1523). Verify TEMP light on DSKY is extinguished.

6.2.5.2.5.1 Set/Verify the following switches on the PSAAM.

a. PSAAM PWR to ON
b. INHIBIT VOLTAGE FAIL to OFF.

6.2.5.2.6 Enter VERB 36 ENTER into K148. Press ERROR RESET pushbutton on K148. All computer alarms on the Main Display Console (MDC) and LEB AGC DSKY shall clear. Verify that DSKY R1, R2, R3, VERB, NOUN and PROG indications are blank.

6.2.5.2.7 Verify the appropriate K-START tape for CM Self-Check Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.5.2.8 Start tape reader.

6.2.5.2.9 When tape reader stops, verify the following on the CRT DSKY display:

R1 = +YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
R2 = +10538 (Tape number)
R3 = -YYYZX (X is the tape revision number, YYY is the spacecraft number when assigned, and Z is the revision to the rope revision number and has meaning for tapes in Section B of Appendix II).

6.2.5.2.10 Start tape reader.

6.2.5.2.11 When tape reader stops, verify:

R1 = 00101

6.2.5.2.12 Start tape reader

6.2.5.2.13 Monitor DSKY until R2 (SCOUNT+1) increments twice. If an error is detected, the PROG alarm lamp on the DSKY shall light.

6.2.5.2.14 On K-148, enter the following to turn off Self-Check:

VERB 21	NOUN 27	ENTR
00000		ENTR
VERB 34		ENTR

6.2.5.2.15 NOTE: Allow 2 hours to elapse before proceeding, with the following exceptions:

a. If the G&N System has been in the power off state for less than 5 days with the gimbals in the following positions,

X = 000.00±005.00 deg
Y = 000.00±005.00 deg
Z = 090.00±005.00 deg

or has been in the power off state for less than 12 days with the gimbals in the following positions,

X = 000.00±001.00 deg
Y = 000.00±001.00 deg
Z = 090.00±001.00 deg

and the system has not been moved, allow 15 minutes to elapse before proceeding.

b. If the G&N System has been turned off with the gimbals in the unparked position for less than 2 hours allow a warmup time equal to the time off but not less than 15 minutes to elapse before proceeding.

CAUTION: If the requirements of 6.2.5.2.16 are not met, remove IMU Operate Power immediately by setting the G/N POWER-IMU switch on the LEB Lighting Control Panel to OFF.

After the required warmup time has elapsed set the G&N IMU MN A and MN B circuit breaker on the Right Hand circuit breaker panel to ON (breaker pushed in), and the G/N POWER-IMU switch on the LEB Lighting Control panel to the IMU position (toggle up).

6.2.5.2.16 Immediately begin monitoring the following measurements.

a. On the CRT verify that IMU Operate Power is +28.8±3 VDC (CG 1500).

6.2.9.5.1 Start the tape reader.

6.2.9.5.2 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.6 Command accuracy 90°.

6.2.9.6.1 Start tape reader.

6.2.9.6.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00501. GIMBAL LOCK lamp will be lighted. Wait 5 seconds.

6.2.9.6.3 Read and record CRT indication of IMU Gimbal angles. The indications shall be 090±003 degrees.

6.2.9.6.4 Read and record CRT CDU angle indications. Indications shall be +090.00±001.50.

6.2.9.7 Command Accuracy 135°.

6.2.9.7.1 Start tape reader.

6.2.9.7.2 When tape reader stops verify CRT DSKY Row 1 indicates 00601. Wait 5 seconds.

6.2.9.7.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 135±003 degrees.

6.2.9.7.4 Read and record CRT CDU angle indications. Indications shall be +135.00±001.50.

6.2.9.8 CDU Repeating Accuracy 135°.

6.2.9.8.1 Start tape reader.

6.2.9.8.2 When tape reader stops verify CRT DSKY Row 1 indicates 00701. Wait 10 seconds, verify GIMBAL LOCK lamp on DSKY is not lighted.

6.2.9.8.3 Start tape reader.

6.2.9.8.4 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 will flash. Read and record CRT DSKY Row 1, 2 and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.9 Plus Gimbal Lock Test.

6.2.9.9.1 Start tape reader.

6.2.9.11.6 Start tape reader.

6.2.9.11.6.1 Wait 15 seconds. Verify IMU Gimbals are at approximately 0° and GIMBAL LOCK LAMP is OFF.

6.2.9.12 Command Accuracy 315°.

6.2.9.12.1 Start tape reader.

6.2.9.12.2 When tape reader stops verify CRT DSKY Row 1 indicates 01501.

6.2.9.12.3 Read and record CRT IMU Gimbal Angles. Indication shall be 315±003 degrees.

6.2.9.12.4 Read and record CRT CDU angle indications. Indications shall be +315.00±001.50.

6.2.9.13 CDU Repeating Accuracy 315°.

6.2.9.13.1 Start tape reader.

6.2.9.13.2 Approximately 5 seconds after the tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.14 Minus Gimbal Lock Test.

6.2.9.14.1 Start tape reader.

6.2.9.14.2 When tape reader stops verify CRT DSKY Row 1 indicates 01701. Verify GIMBAL LOCK lamp is lighted after approximately 5 seconds.

6.2.9.15 CDU Repeating Accuracy 225°.

6.2.9.15.1 Start tape reader.

6.2.9.15.2 When tape reader stops verify CRT DSKY Row 1 indicates 02001. Wait 10 seconds before continuing. Verify GIMBAL LOCK lamp is OFF.

6.2.9.15.3 Start tape reader.

6.2.9.15.4 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 will flash. Read and record CRT DSKY Row 1, 2 and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.16 OG CDU Fine Fail Test.

6.2.9.16.1 Start tape reader.

6.2.11.10 From the uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the Shaft CDU register (address 36) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) and the PROG alarm discrete for the period during which the OPTICS CONTROL STICK was being displaced above. The Shaft CDU angle shall be 225.00±10.00 degrees at the time the PROG alarm occurred. The elapsed time from time of OPTICS CONTROL STICK displacement to the time the PROG alarm discrete is obtained shall be 19 to 32 seconds.

6.2.11.11 Set the OPTICS COUPLING switch to DIRECT. Again using the OPTICS CONTROL STICK, drive the optics until R1 = +225.00 and R2 = +10.000. Set the OPTICS COUPLING switch to RSLV.

6.2.11.12 While sighting on the optical target through the SCT eyepiece, displace the OPTICS CONTROL STICK fully to the right. Verify that the target image appears to move in a straight line horizontally to the right and release the OPTICS CONTROL STICK when the target image reaches the edge of the SCT field of view.

6.2.11.13 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +5 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS COUPLING switch on the G&N Panel to DIRECT. Set the OPTICS ZERO switch to ZERO.

DATA SHEET

CALCULATION	PARAMETER	UNITS	
$\frac{\text{line a + line q}}{2}$ = ( )___.__ $\frac{\text{NBDY - ADOAY + NBDY + ADOAY}}{2}$ Transfer result to line ao	NBDY	meru	t
$\frac{\text{line q - line a}}{2}$ = ( )___.__ $\frac{\text{NBDY + ADOAY - (NBDY - ADOAY)}}{2}$	ADOAY	meru/g	u
$\frac{\text{line b + line s}}{2}$ = ( )___.__ $\frac{\text{NBDZ - ADOAZ + NBDZ + ADOAZ}}{2}$ Transfer result to line ap	NBDZ	meru	v
$\frac{\text{line s - line b}}{2}$ = ( )___.__ $\frac{\text{NBDZ + ADOAZ - (NBDZ - ADOAZ)}}{2}$	ADOAZ	meru/g	w
$\frac{\text{line e - line o}}{2}$ = ( )___.__ $\frac{\text{NBDX - ADOAX - (-NBDX - ADOAX)}}{2}$ Transfer result to line aq	NBDX	meru	x
$\frac{\text{line e + line o}}{2}$ x (-1) = ( )___.__ $\frac{\text{NBDX - ADOAX - NBDX - ADOAX}}{2}$ x (-1)	ADOAX	meru/g	y

DATA SHEET (x_i)

PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
NBDY	meru	-15		+15			ao
NBDZ	meru	-15		+15			ap
NBDX	meru	-15		+15			aq
ADSRAY	meru/g	-40		+40			ar
ADSRAZ	meru/g	-40		+40			as
ADSRAX	meru/g	-40		+40			at
ADIAX	meru/g	-100		+100			au
ADIAZ	meru/g	-100		+100			av
ADIAY	meru/g	-100		+100			aw
X PIPA S.F. error from line ai	PPM	-1900		+1900			ax
Y PIPA S.F. error from line aj	PPM	-1900		+1900			ay
Z PIPA S.F. error from line ak	PPM	-1900		+1900			az
X PIPA Bias from line al	cm/sec^2	-3.1		+3.1			ba
Y PIPA Bias from line am	cm/sec^2	-3.1		+3.1			bb
Z PIPA Bias from line an	cm/sec^2	-3.1		+3.1			bc

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POST INSTALLATION CHECKOUT PROCESS SPECIFICATION FOR THE APOLLO GUIDANCE & NAVIGATION SYSTEM BLOCK II-KSC WITH COLOSSUS FLIGHT ROPES

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				DE	NASA
1/20/70	G	38001	2,21,22,26-28,42,45,54,60-133	EA	MDH
			Was 133 pages, now 142 pages.		
4/2/70	H	38090	17-19, 141, 142	EA	MDH
11/23/70	J	38293	17-142. Was 142 pages, now	EA	MDH
			143 pages. JFD/AC		
2/8/71	K	38348	36-143, was 143 pages now 151	EA	MDH
			pages. JFD/AC		
3/19/71	L	38396	36, 71, 130, 133 JFD/DE	EA	MDH

This specification consists of page 1 to 151 inclusive.

APPROVALS	Not Required CCA497-0274 **NASA/MSC**	**MIT/IL**	CCB E. N. Austin 7/25/68	D. A. Ziemer **DE**	AEA

6.2.3.1.13 1 hour after the application of IMU OPERATE power monitor and record PIPA TEMP (CG 2300) every 5 minutes for 30 minutes. Verify that each reading does not deviate from the average of each signal by more than 0.1° F.

6.2.3.1.14 When 2 hours have elapsed since the application of IMU OPERATE power record PIPA TEMP. PIPA TEMP shall be 130.5±1.5° F. PIPA TEMP shall be within 0.5° F of that recorded in 6.2.3.1.12 and 6.2.1.3.8.4.

6.2.3.1.15 IMU Heater Current Duty Cycle Determination

NOTE: This test is to be performed once in the MSO and at the PAD during FRT.

6.2.3.1.15.1 The following initial conditions must be met before continuing:

(1) The G&N System shall have been in the Operate Mode at least 1.5 hours with the IMU ginbals coarse aligned to zero degress.

(2) The IMU coolant flow rate and coolant temperature shall have been constant for at least one hour prior to taking data.

(3) The 28VDC IMU STANDBY BUS (CG 1510) shall be held constant within ±0.25 VDC for one hour prior to taking data.

6.2.3.1.15.2 Record and identify the following signals as indicated.

	Signal No.	Signal Name	I. D.
a.	CG 1510	28 VDC IMU STANDBY	E_{B+}
b.	CG 1202	IMU 28V 800 CPS, Phase A	E_A
c.	CG 1203	IMU 28V 800 CPS, Phase B	E_B
d.	CF 0157	CM Vehicle Coolant Flow Rate	R
e.	CF 0018	Coolant Temperature	T

6.2.3.1.15.3 Perform the following calculation and identify the result as E_{AB}:

$$\frac{E_A + E_B}{2} = E_{AB}$$

6.2.3.1.15.4 Calculate the Duty Cycle for the IMU HEATER CURRENT (CG 2302) by dividing the time ON for 10 cycles by the total (ON and OFF) time for 10 cycles as indicated on the event recorder. Identify the result as DC_{ACT}.

6.2.3.1.15.5 Normalize the calculated Duty Cycle (DC_{ACT}) for power input as follows:

$$DC_{S/C} = DC_{ACT} \left[0.071 \left(E_{B+} + E_{AB} \right) - 2.976 \right]$$

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POST INSTALLATION CHECKOUT PROCESS SPECIFICATION FOR THE APOLLO GUIDANCE & NAVIGATION SYSTEM BLOCK II-KSC WITH COLOSSUS FLIGHT ROPES

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				AC	NASA

This specification consists of page 1 to 130 inclusive.

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1.0 INTRODUCTION

1.1 The individual Spacecraft (SC) installed Guidance and Navigation (G&N) System to be checked out per this process specification shall consist of one of each of the following major assemblies: The applicable part numbers shall be determined by drawing No. 2014999.

1 - Optical Unit Assembly

1 - Navigation Base Assembly, Block II

1 - Inertial Measurement Unit (IMU) & PIPA Elect. Assy

1 - Power and Servo Assembly (PSA)

1 - Apollo Guidance Computer Group

1 - G&N Interconnect Harness Assembly

1 - Signal Conditioner Assembly

1 - Display and Control Group (D & C)

1 - Coupling Data Unit

1.2 The G&N System herein shall be identified as a Block II system. The computer contains the program flight ropes in the core rope memory. The test requirements herein are based on Colossus Rev. 217 flight ropes.

2.0 SCOPE

2.1 This specification outlines the checkout requirements for the G&N System installed in the Apollo Command Module Spacecrafts and tested in the VAB, MSOB, or on the PAD.

2.2 This document is to be used as technical support for all Block II G&N System test documentation for Command Module spacecraft testing. This document shall be amended by addendum to support applicable hardware, mission or program differences.

4.0 MATERIAL AND EQUIPMENT

4.1 The following test equipment shall be used to perform the requirements of this specification. If protection to personnel and equipment is not decreased, items, except government furnished parts, equivalent to those listed may be used.

ITEM	QUANTITY	DESCRIPTION
1	1	Digital Test Measurement System, Model No. C14-208
2	1	Digital Test Command System, Model No. C14-207
3	1	Data Interleaver System, Model No. C14-232
4	1	External Digital Test Command Unit, Model No. C14-231
5	1	S/C Ground Power Supply, Model No. C14-418
6	1	Breakout Box, Test, CM-SM Adapter, Model No. C14-467
7	1	Electrical Cable Set, Model No. C34-391
8	1	ICTC 513-100, Model 513-100 (MSO only)
9	1	PSA Adapter Module, Model No. A23-304
10	1	Optics Supporting Fixture, Model A14-135 (MSO only)
11	1	G&N Installation Qualification Fixture, Model No. A23-097 (MSO only)
12	1	Theodolite (DKM 3 or equivalent), Model No. A23-079
13	1	Retroflecting Prism, Model No. A23-200
14	1	Portable Light Assembly, Model No. A23-196
15	1	Vacuum Tube Volt Ohmmeter (VTVOM)
16	1	Calculator (Friden or equivalent)
17	1	Movable Optics Target
18	1	SCT Resolution Check Card
19	1	Electrical Cable Portable G&N System, Model No. C14-462
20	1	Electronic Counter with Preset Counter (Hewlett Packard 5245L with 526A Preset Plug-In Unit, or equivalent).

5.1.2.5 The G&N System shall be operating in STANDBY mode with CMC power applied for a minimum of two hours prior to torquing of inertial components. In the event STANDBY or CMC power is interrupted, an equivalent time period shall be allowed when power is restored before transfer to the OPERATE mode, except that when the interval of interruption exceeds two hours, a two-hour warmup period shall be sufficient. Exceptions to the above are noted in 5.2.5.2.

5.1.2.6 The interruption of +28 VDC power to the G&N System through the Main A and Main B power busses shall be cause for the Command Module G&N System operator to immediately initiate the Emergency shutdown procedure (6.1.4) to preclude damage to the G&N System.

5.1.2.7 The SCT and SXT eyepieces shall be stowed whenever the instruments are not in use to preclude damage to them. It shall be necessary to install the eyepieces when testing requires use of the instrument.

5.1.2.8 To preserve the operational life of the components of the MDC and LEB DSKY's, the monitor routines shall be used only when required by test procedure or troubleshooting. Such routines shall be terminated as quickly as possible in the test flow. Computer routines which cause the DSKY display to flash (either requesting data or displaying data) shall also be terminated as quickly as possible.

5.1.2.9 To reduce the possibility of the optics drifting into the stops, place the optics in the ZERO mode whenever the optics power is to be on and not used for any appreciable time.

5.1.2.10 Avoid repeated slewing of SXT Shaft and Trunnion into the mechanical stops.

5.1.2.11 Prior to performing a ZERO OPTICS, the SXT Trunnion shall be carefully slewed to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). In no event shall the OPTICS be ZEROED from angles greater than +10 degrees on Trunnion.

5.2 Standard Environmental Conditions

5.2.1 The G&N System when installed in the Command Module shall be tested in an environment in accordance with ICD MH01-1348-416. Dust covers shall be installed on the SXT and SCT per ICD MH01-01350-116 when optics are not under test.

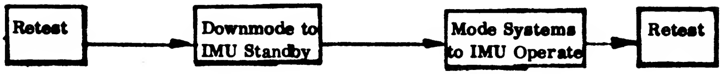
5.4.1 (continued)

Paragraph No.	
6.2.9	Semi-Automatic Mode Test
6.2.10	Zero Optics Test
6.2.11	Optics Coordinate Transformation Control Test
6.2.12	Optics Function Test - VAD and PAD
6.2.13	Optics Slew Rate Test
6.2.14	Stabilization Loop Step Response Test
6.2.15	IRIG Scale Factor Test
6.2.16	IMU Performance Test
6.2.17	SXT-NB-IMU Fine Align Test
6.2.18	Gyrocompassing Test
6.2.19.	Voltage Margin Test

5.5 Retest Requirements

5.5.1 Failure of the D criteria for IRIG and PIPA parameters.

5.5.1.1 If D_1, D_2, or D_3 exceeds its maximum value as specified in Table D of Paragraph 6.2.16.22.5 for any IRIG or PIPA, a retest sequence shall be initiated as indicated below:



RETEST SEQUENCE

The retest sequence shall be performed using the paragraphs indicated in Table I corresponding to the out-of-spec parameters. Table II indicates the test positions and other isolated parameters that must be recalculated and qualified.

If D_1, D_2, or D_3 exceeds its maximum value after the retest sequence is completed, the requirements of 5.5.1.2 (IRIG) or 5.5.1.3 (PIPA) shall apply. If D_1, D_2, and D_3 are within tolerances specified in Table D after the retest sequence is completed, the original out-of-tolerance D terms calculated in paragraph 6.2.16.22.5 shall be exonerated.

5.5.1.2 IRIG stability requirements.

5.5.1.2.1 Failure to be within the maximum values for D_1 or D_2 or D_3 after the retest sequence shall constitute failure of the unit.

TABLE I

O.O.S. PARAMETERS	6.2.16.1 thru 6.2.16.6.1	6.2.16.___																		
		7. all	8. thru 8.4.3	8. thru 8.5.2	8. all	9. all	10. thru 10.4.3	10. thru 10.5.2	10. all	11. all	12. all	13. all	14. all	15. all	16. all	17. thru 17.4.3	17. all	18. thru 18.4.3	18. all	19. all
NBDX	X					X										X				
NBDY	X	X																X		
NBDZ	X		X																	X
ADSRAX	X					X						X				X				
ADSRAY	X	X					X											X		
ADSRAZ	X		X											X						X
ADIAX	X	X			X	X										X				
ADIAY	X	X			X	X						X			X	X		X		
ADIAZ	X		X			X			X											X
X PIPA BIAS & S. F. ERROR	X			X															X	
Y PIPA BIAS & S. F. ERROR	X									X	X									
Z PIPA BIAS & S. F. ERROR	X							X									X			

Terminate all retest sequences with VERB 36 ENTR

TABLE III

RETEST MATRIX

Paragraph Number	Test Title	IMU	NAV BASE	OPTICS	CMC	PSA	LEB DSKY	MDC DSKY	SIG COND	CDU	G&N HARNESS	PIPA ELECT.	INDICATOR CONTROL PANEL
5.7.2	AGC Ground Check				X								
6.2.1	Application of Standby Power to G&N System	X	X		X	X	X	X	X	X	X	X	
6.2.5*	General Turn Off and Turn On Procedure	*		*	*	*	*	*	*	*	*	*	*
6.2.3	Operate Power On Test	X	X		X	X			X	X	X	X	
6.2.2	CMC Operational Test				X		X	X		X	X		X
6.2.8	G&N Panel Brightness and Lamp Test	X	X	X		X					X		X
6.2.6	IMU Operational Test	X	X		X	X				X	X	X	
6.2.10	Zero Optics Test		X	X	X	X			X	X	X		X
6.2.13	Optics Slew Rate Test		X	X	X	X			X	X	X		X
6.2.11	Optics Coordinate Transformation Control Test		X	X		X					X		X
6.2.12	Optics Function Test - VAB and PAD		X	X	X	X				X	X		X
6.2.9	Semi-Automatic Mode Test	X	X	X	X	X			X	X	X		
6.2.14	Stab Loop Step Response Test	X	X			X			X				
6.2.15	IRIG Scale Factor Test	X	X			X							
6.2.16	IMU Performance Test	X	X			X						X	
6.2.17**	SXT-NB-IMU Fine Align Test	X	X	X						X	X		
6.2.19	Voltage Margin Test				X					X	X		
6.2.7	Gimbal Friction Test	X	X						X		X		
6.2.18	Gyrocompassing Test	X	X			X						X	
6.2.4	G&N Power Supplies Test		X		X	X			X	X	X	X	

* To be used as necessary to turn system on and off.

** Procedure from Specification ND1002325 with SUNDIAL ropes installed.

5.9.1.2 A record of the amount of time each of the four prime power busses are "on" shall be kept and forwarded to the next receiving agency.

5.10 Interface

5.10.1 The Apollo G&N System shall interface with accepted ECS and EPS distribution systems for power and environment control purposes and with the SCS or or SCS substitute system for signal interface in accordance with the applicable ICD's.

5.11 General System Operating Characteristics.

5.11.1 The program does not always automatically display computer error codes when a PROG alarm occurs. If error code is desired enter the following on K-148 and then observe the DSKY display.

VERB 05 NOUN 09 ENTR

R1 = FAILREG
R2 = FAILREG + 1
R3 = FAILREG +2

5.11.2 The DSKY "NO ATT" lamp illuminates any time the system is in the Coarse Align Mode, IMU Cage, or during turn on.

5.11.3 Tracker Fail lamp may light after optics power turn on. Press the RSET pushbutton to extinguish.

5.11.4 The CMC warning light may come on for approximately 20 seconds when +28 VDC CMC Operate Power is applied; if the MASTER ALARM light illuminates, push to reset.

5.11.5 When coming out of AGC STBY, if the Standby lamp does not extinguish when the PRO pushbutton is pressed, repeatedly press the PRO pushbutton until the Standby lamp does extinguish. Record the number of times it was necessary to press the STBY pushbutton. No more than three depressions of the PRO pushbutton shall be required to turn the STBY lamp off.

6.0 DETAIL REQUIREMENTS

6.1 Initial Test Conditions

6.1.1 The following precautions shall be observed to preclude loss of continuity in inertial component performance history of the IMU. Deviation may necessitate recalibration of the inertial components.

6.1.1.1 The IMU shall be supplied with heater power on a continuous basis. When S/C Ground Power Supply, Model No. C14-418 is not providing heater power, then the heater power shall be supplied through the Portable Temperature Controller (PTC) Model No. S23-011. The temperature of the IRIG's shall be maintained between 120° and 150°F. The temperature of the PIPA's shall be maintained between 115° and 145°F.

6.1.1.2 The Standby Mode is identified by the circuit breakers IMU HTR MN A, IMU HTR MN B, COMPUTER MN A and MN B in the ON position and the G&N Power-IMU switch on LEB Lighting Control Panel in the OFF position. The Operate Mode is identified by the circuit breaker IMU HTR MN A, MN B, COMPUTER MN A and MN B in the ON position and the G&N Power-IMU switch on the LEB Lighting Control Panel in the ON position. The G&N System shall be operating in the Standby Mode with CMC power ON for a minimum of two hours prior to advancing to the IMU Operate Mode. In the event Standby or CMC power is interrupted, an equivalent time period, but not less than 15 minutes, shall be allowed when power is restored before advancing to the Operate Mode, except that when the interval of interruption exceeds two hours, a two-hour warmup period shall be mandatory (exceptions to the 2-hour warmup are noted in 6.2.5.2).

6.1.1.3 The Inertial Measurement Unit shall not be without heater power for more than 15 minutes.

6.1.1.4 During the turn on of the G&N power, COMPUTER MN A and MN B and IMU HTR MN A and IMU HTR MN B circuit breakers must be turned on before the IMU MN A and IMU MN B circuit breakers on the Right Hand Circuit Breaker Panel of the CM. During the turn off of the G&N power the IMU MN A and IMU MN B circuit breakers must be turned off before the IMU HTR MN A and IMU HTR MN B circuit breakers on the Right Hand Circuit Breaker Panel of the CM. In no case shall COMPUTER MN A and MN B circuit breaker be turned off before IMU MN A and MN B circuit breakers.

6.1.1.5 A warmup period of 1 hour with OPERATE power applied shall be required prior to performing any test in which gyro and accelerometer parameters are measured, and 15 minutes warmup prior to any test in which precision amplitude and frequency power supply checks are made.

6.1.1.6 The following Command Module switches shall be in the position shown unless specifically directed otherwise in a procedural function.

a. UP TLM switches on the LEB G&N Control Panel and MDC Panel 2 shall be set to ACCEPT.

b. LAUNCH VEHICLE - GUIDANCE switch on MDC Panel 2 shall be set to IU.

c. The SC CONT switch on MDC Panel 1 shall be set to CMC.

d. The CMC MODE switch on MDC Panel 1 shall be set to AUTO.

e. The V CG switch on MDC Panel 1 shall be set to CSM.

f. The LIGHTS-INTEGRAL control on the LEB Lighting Control Panel and the Left Hand Circuit Breaker panel shall be set to the minimum brightness - OFF position.

6.1.2 The following optical reference alignment requirements shall be demonstrated - MSO only.

6.1.2.1 G&N Installation Qualification Fixture.

6.1.2.1.1 The SXT Optical Reference No. 1 (Azimuth Autoset) LOS shall be located approximately 40 degrees (CW when viewed from above) from the SCZ axis measured in a horizontal plane. At this position, the Optical Reference shall be capable of being viewed through the SXT ST LOS.

6.1.2.1.2 The SXT Optical Reference LOS position with respect to the horizontal plane shall be known to within 5 arc-seconds. The azimuth bearing of the Optical Reference LOS shall be known to within ±30 minutes of arc.

6.1.2.1.3 The SXT Optical Reference No. 2 LOS shall be located approximately 80 degrees from the SXT Optical Reference No. 1 (40 degrees from S/C Z axis) measured in a horizontal plane. At this position, the Optical Reference shall be capable of being viewed through the SXT STAR LOS.

6.1.2.1.3.1 The SXT optical reference LOS position with respect to the horizontal plane shall be known to within 5 arc-seconds. The azimuth bearing of the Optical Reference LOS shall be known to within ±30 minutes of arc.

6.1.2.1.4 SXT Optical Reference No. 3 shall be capable of being viewed through the SXT LLOS and the STAR LOS simultaneously at the Zero Optics position.

6.1.2.1.4.1 SXT Optical Reference No. 3 shall have the capability to measure the non-parallelism of the LLOS and STAR LOS to a resolution of 2 arc-seconds.

6.1.3 **Emergency Shutdown Procedure**

CAUTION: In the event of a malfunction occurrence which could damage the G&N System before the normal shutdown procedure 6.2.5 could be performed, the following sequence should be utilized in the spacecraft.

6.1.3.1 On the LEB Lighting Control Panel set the G/N POWER-IMU and G/N POWER - OPTICS switches to OFF.

6.1.3.2 On the Right Hand Circuit Breaker Panel set the following switches and circuit breakers to OFF (breakers pulled out).

a. GUIDANCE/NAVIGATION COMPUTER MN A and MN B

b. GUIDANCE/NAVIGATION IMU HTR MN A and MN B

c. G/N POWER switch to OFF

d. GUIDANCE/NAVIGATION IMU MN A and MN B

e. GUIDANCE/NAVIGATION OPTICS MN A and MN B

f. GUIDANCE/NAVIGATION POWER AC 1 and AC 2

6.1.3.3 Verify that the PTC is providing heater power to the G&N System.

6.2 **Test Procedures**

6.2.1 **Application of Standby Power to G&N System**

6.2.1.1 All power and control switches on the G&N Indicator Control Panel shall be placed in the OFF or neutral position.

6.2.1.2 The Portable Temperature Controller (PTC), shall be supplying inertial component heater power to the G&N System through the PSA, Connector No. 45J2.

6.2.1.3 Computer Power On

6.2.1.3.1 Set the POWER-AC1 and AC2 breakers on the Right Hand Circuit Breaker Panel to ON (breakers pushed in), and position G/N POWER switch to AC1.

6.2.1.3.2 Set the G&N COMPUTER MN A and MN B Breakers on the Right Hand Circuit Breaker Panel to ON (breakers pushed in).

6.2.1.3.3 Set the computer numerical display lights to the minimum acceptable brightness by rotating the Brightness Controls on the MDC and LEB Lighting Control Panels.

6.2.1.3.4 The +28 VDC CMC OPERATE voltage (CG 1520) shall be +28.8±3 VDC. Verify CRT indication. On DSKY verify TEMP light is ON. On the G&N Indicator Control Panel verify PGNS light is ON.

6.2.1.3.5 The voltage output of the +4 VDC CMC supply shall be +4.00±0.20 VDC. (CG 1030). The value on the CRT shall be recorded.

6.2.1.3.6 The voltage output of the +14 VDC CMC supply shall be +14.0±0.4 VDC, (CG 1020). The value on the CRT shall be recorded.

6.2.1.3.7 Using DSKY, enter VERB 36, ENTR, then press RESET. Verify that R1, R2, R3, VERB, NOUN, and PROG are blank.

6.2.1.3.8 IMU HTR Heater Power On

6.2.1.3.8.1 Enter the IMU Standby Mode of operation by engaging the IMU HTR MN A and MN B breakers on the Right Hand Circuit Breaker Panel (breakers pushed in).

NOTE: RESTART Lamp may illuminate, if it does, disregard and press RSET on the DSKY.

6.2.1.3.8.2 Verify that the IMU +28 VDC STANDBY discrete lamp on Event Module is illuminated (CG 1513). On DSKY verify TEMP light is extinguished. On the G&N Indicator Control Panel verify PGNS light is extinguished.

6.2.1.3.8.3 Record the value of the following signals displayed on the CRT.

	Signal	Requirement
a.	CG 1331 28V 3200 CPS POWER SUPPLY FEEDBACK	28.6±0.6 VRMS
b.	CG 1510 +28 VDC STANDBY POWER	28.8±3 VDC

6.2.1.3.8.4 The PIPA TEMP on the CRT shall be monitored at 15 min., 1 hr. and 2 hrs. from execution of 6.2.3.8.1 to insure that the PIPA Temperature Control Loop circuitry is operating to maintain a temperature of 130.5±1.5°F (CG2300).

6.2.1.3.8.5 At the end of the 2-hour period, record the PIPA temperature (CG2300) on the CRT. On the event recorder verify that the IMU HEATER current discrete (CG2302) is ON and that the IMU BLOWER current discrete (CG2303) is OFF over the last two hour period (occasionally discretes may cycle).

6.2.1.3.8.6 With the eyepiece in the Eyepiece Storage Unit, check the eyepiece surface temperature at the quick disconnect flange using an L&N #8693 Temperature Potentiometer, or a similar type thermocouple probe meter. Record both the ESU ambient and eyepiece surface temperatures. Verify that the eyepiece surface temperature is between 5 and 30 degrees F. above the ambient temperature.

6.2.2 CMC Operational Test

NOTE: Verify that IMU STANDBY power (including CMC operate power) is applied, IMU OPERATE Power is not applied. (G&N IMU HTR MN A and MN B breakers engaged, Computer MN A and MN B breakers engaged, IMU MN A and MN B breakers disengaged, G/N Power-IMU switch on LEB Lighting Control Panel in OFF Position).

6.2.2.1 CMC Self-Check.

6.2.2.1.1 On K-148, enter the following:

VERB 36 ENTR . Wait 10 seconds.

6.2.2.1.2 Verify K-START tape F09C103-K10538-XXCM Self-Check Test is on the K-START tape reader.

6.2.2.1.3 Start tape reader.

6.2.2.1.4 When tape reader stops, verify:

R1 = +09XXX
R2 = +10538 (tape number)
R3 = -000XX(tape revision)

6.2.2.1.5 Load E-Memory Program.

6.2.2.1.5.1 Start tape reader.

6.2.2.1.5.2 When tape reader stops, verify R1 displays +00101.

6.2.2.1.6 Initiate Self-Check

6.2.2.1.6.1 Start tape reader.

6.2.2.1.6.2 When R3 = 00002, start tape reader.

6.2.2.1.6.3 When tape reader stops, wait 30 seconds.

6.2.2.2 DSKY Check.

6.2.2.2.1 Start tape reader.

6.2.2.2.2 All the electroluminescent elements (PROG, VERB, NOUN, and Row 1, Row 2, Row 3) shall display the decimal number nine (9). Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's

6.2.2.2.2 (continued)

d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row's 1, 2, 3
l. VERB-NOUN Flashing
m. COMP ACTY

On concurrently for 5 seconds.

n. Plus signs in Row's 1, 2, 3
o. VERB-NOUN Flashing
p. COMP ACTY

On concurrently for 5 seconds.

q. DSKY blanks - - COMP ACTY remains on for approximately 5 seconds and then blanks.

6.2.2.3 Caution and Status Displays

6.2.2.3.1 Enter VERB 35, ENTR, into LEB CMC DSKY.

6.2.2.3.2 The following MDC and LEB CMC DSKY displays shall illuminate for approximately 5 seconds.

a. UPLINK ACTY

b. NO ATT

c. STBY

d. KEY REL Flashing

e. TEMP

f. GIMBAL LOCK

g. PROG

h. RESTART

i. TRACKER

j. OPR ERR Flashing

k. COMP ACTY

l. Program 88

m. VERB 88 NOUN 88 flashing

n. +88888 in R1, R2 and R3

o. PGNCS, CMC, ISS Warning lamps (CMC shall remain illuminated for 15±5 seconds).

After indications a. through m. go out, +88888 shall remain in R1, R2, R3.

6.2.2.4 DSKY Pushbutton Check

6.2.2.4.1 Enter the following sequence into the LEB CMC DSKY.

a. VERB 25 NOUN 01, ENTER
b. 02100, ENTER
c. +00123, ENTER
d. -00456, ENTER
e. -00789, ENTER

6.2.2.4.2 The LEB CMC DSKY shall indicate +00123 in R1, -00456 in R2, and -00789 in R3.

6.2.2.4.3 Enter VERB 05, NOUN 01 into the LEB CMC DSKY. Press the ENTER pushbutton.

6.2.2.4.4 Enter 02100 into LEB CMC DSKY. Press the ENTER pushbutton. The LEB CMC DSKY shall indicate 00024 in R1, 77664 in R2, and 77576 in R3. Verify.

6.2.2.4.5 Enter the following sequence into the LEB CMC DSKY.

a. VERB 21 NOUN 01, ENTER
b. 02100, ENTER
c. +00123, DO NOT press ENTER

6.2.2.4.5.1 Press the CLEAR pushbutton. R1 shall clear.

6.2.2.4.6 Enter VERB 06 NOUN 70 into the LEB CMC DSKY. Press the ENTER pushbutton. The OPR ERR lamp shall light.

6.2.2.4.6.1 Press the RESET pushbutton. The OPR ERR lamp shall extinguish.

6.2.2.4.7 Enter the following sequence into the LEB CMC DSKY. Press the ENTER pushbutton as indicated. The KEY REL lamp shall light.

a. VERB 16, NOUN 20, ENTER
b. VERB

6.2.2.4.7.1 Press the KEY REL pushbutton. The KEY REL lamp shall extinguish.

6.2.2.4.7.2 Enter VERB 36, into the LEB CMC DSKY. Press the ENTER pushbutton.

6.2.2.4.8 Press the PRO pushbutton and verify the CH 32 on the CRT displays 5XXXX. Release the PRO pushbutton and verify that CH 32 on the CRT displays 7XXXX.

6.2.2.4.9 Repeat 6.2.2.4.1 through 6.2.2.4.8 using the MDC CMC DSKY.

6.2.2.5 **Uplink and Downlink Checks.**

6.2.2.5.1 Enter VERB 36 into K148. Press the ENTER pushbutton, then press RESET pushbutton.

6.2.2.5.2 Enter the following sequence into K148:

a. VERB 25 NOUN 01 ENTER
b. 02100, ENTER
c. 00000, ENTER
d. 77777, ENTER
e. 07254, ENTER
f. VERB 05 NOUN 01, ENTER
g. 02100, ENTER

6.2.2.5.3 CMC Registers R1, R2, and R3 display on the CRT shall indicate 00000, 77777, and 07254, respectively.

6.2.2.5.4 Set/Verify that the UP TLM switch on the Main Display Panel is set to ACCEPT and that the UP TLM switch on the G&N Indicator Control Panel is set to BLOCK.

6.2.2.5.5 Execute the Block Uplink Override R-START to enable data to be sent via K-START. On K-148 insert VERB. Verify that the VERB indications on the DSKY and CRT does not change.

6.2.2.5.6 Set the UP TLM switch on the G&N Indicator Control Panel to ACCEPT. Verify that the BLOCK UPLINK discrete is OFF.

6.2.2.5.7 On K-148 insert VERB 01. Verify that the VERB indication on the DSKY and CRT is 01.

6.2.2.5.8 Set the UP TLM switch on the MAIN DISPLAY Panel to BLOCK. Verify that the BLOCK UPLINK discrete is ON.

6.2.2.5.9 On K-148 insert VERB. Verify VERB indication on the DSKY and CRT does not change.

6.2.2.5.10 Set the UP TLM switch on the MAIN DISPLAY Panel to ACCEPT. Verify that the BLOCK UPLINK discrete is OFF. Remove the Block Uplink Override R-START.

6.2.2.5.11 On K-148 insert VERB 36. Press the ENTER pushbutton.

6.2.2.6 **Parity Fail Test**

6.2.2.6.1 Enter the following into K-148: [illegible]

a. VERB 24 NOUN 02, ENTER
b. 02100 ENTER
c. 33777, ENTER
d. 04544, ENTER
e. VERB 25 NOUN 26, ENTER
f. 04000, ENTER
g. 01500 ENTER
h. 00004 ENTER
i. VERB 30, ENTER

The RESTART lamps on the MDC & LEB DSKY's shall illuminate. The PGNS caution lamps on the MDC & LEB annunciator panels shall illuminate.

6.2.2.6.2 Press the ERROR RESET pushbutton on K-148. The RESTART & PGNS caution lamps shall extinguish.

6.2.2.6.3 Enter VERB 36, into K-148. [illegible]. Press the ENTER pushbutton.

6.2.2.7 Rupt Lock Test

6.2.2.7.1 Enter the following sequence into K-148: [illegible]

a. VERB 24 NOUN 01, ENTER
b. 02100, ENTER
c. 30001, ENTER
d. 01500, ENTER
e. VERB 25 NOUN 26, ENTER
f. 00001, ENTER
g. 01500, ENTER
h. 00004, ENTER
i. VERB 31, ENTER

The RESTART and PROG lamps on the MDC and LEB DSKY's shall illuminate. The PGNS caution lamps on the MDC & LEB annunciator panels shall illuminate.

6.2.2.7.2 Press the ERROR RESET pushbutton on K-148: [illegible]. The RESTART & PGNS caution lamps shall extinguish.

6.2.2.7.3 Enter VERB 36 into K-148: [illegible] Press the ENTER pushbutton.

6.2.2.8 TC Trap Test

[illegible]

6.2.2.8.1 Enter the following sequence into K-148:

a. VERB 21 NOUN 02, ENTER
b. 02100 ENTER
c. 01500 ENTER
d. VERB 25 NOUN 26 ENTER
e. 04000, ENTER
f. 01500, ENTER
g. 00004, ENTER
h. VERB 30, ENTER

The RESTART and PROG lamps on the MDC & LEB DSKY's shall illuminate. The PGNS caution lamps on the MDC & LEB annunciator panels shall illuminate.

6.2.2.8.2 Press the ERROR RESET pushbutton on the K-148. The RESTART & PGNS caution lamps shall extinguish.

6.2.2.8.3 Enter VERB 36 into K-148. Press the ENTER pushbutton.

6.2.2.9 Nightwatchman Test

6.2.2.9.1 Enter the following sequence into the K-148:

a. VERB 24 NOUN 01, ENTER
b. 02100, ENTER
c. 30001, ENTER
d. 01500, ENTER
e. VERB 25, NOUN 26, ENTER
f. 04000, ENTER
g. 01500, ENTER
h. 00004, ENTER
i. VERB 30, ENTER

The RESTART and PROG lamps on the MDC & LEB DSKY's shall illuminate. The PGNS caution lamps on the MDC & LEB annunciator panels shall illuminate.

6.2.2.9.2 Press the ERROR RESET pushbutton on K-148. The RESTART & PGNS caution lamps shall extinguish.

6.2.2.9.3 Enter VERB 36 into K-148. Press the ENTER pushbutton.

6.2.2.10 CMC Clock Frequency Test

6.2.2.10.1 Insure that CMC operate power has been applied for a minimum of 10 minutes before performing this test.

6.2.2.10.2 Verify that the counter is connected to the 3.2 kc signal on the hardline.

6.2.2.10.3 Insure that the counter has been warming up for a minimum of 30 minutes.

6.2.2.10.4 On the counter,

Set the FUNCTION switch to: MAN START
Set the TIME BASE switch to: 1 μsec TIME UNIT/COUNT
Set the SENSITIVITY control to: CHECK

6.2.2.10.5 Verify proper counter operation.

6.2.2.10.6 Set the FUNCTION switch to REMOTE OR TIME INTERVAL.

6.2.2.10.7 Plug in the Preset unit and set:

MODE switch to PRESET
N switches to 96000.

6.2.2.10.8 Turn SAMPLE RATE control fully clockwise (HOLD). Wait 35 seconds for counter display to fill.

6.2.2.10.9 Start counting by depressing RESET switch on counter.

6.2.2.10.10 After approximately 30 seconds, read and record counter display.

6.2.2.10.11 Repeat steps 6.2.2.10.9 and 6.2.2.10.10 nine times.

6.2.2.10.12 The average of the 10 previous readings shall be 30.000000±0.000060 seconds.

6.2.2.10.13 Insure that the system is not in IMU Operate.

6.2.2.10.14 Perform the following DSKY operations:

VERB 37 ENTR
06 ENTR/ENTR

Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the STBY lamp is lit.

6.2.2.10.15 Repeat steps 6.2.2.10.9 through 6.2.2.10.12.

6.2.2.10.16 Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the STBY lamp is not lit. If the STBY lamp does not extinguish when the PRO pushbutton is pressed, repeatedly press the PRO pushbutton until the STBY lamp does extinguish. Record the number of times it was necessary to press the PRO pushbutton. Not more than three depressions of the PRO pushbutton shall be required to turn the STBY lamp off.

6.2.2.11 Minimum Impulse Controller Input Test.

6.2.2.11.1 Enter the following into the DSKY.

a. VERB 11 NOUN 10, ENTER
b. 00032 ENTER

6.2.2.11.2 Set the Minimum Impulse Controller on the Indicator Control Panel to the following position and observe R1 of the DSKY for the proper indications.

MIC Position	R1 DSKY Indication
a. Up	77775
b. Down	77776
c. Left	77737
d. Right	77757
e. Clockwise	77773
f. Counterclockwise	77767
g. Neutral	77777

6.2.2.11.3 Enter VERB 34, ENTER into the DSKY.

6.2.2.12 Mark and Mark Reject pushbutton test.

6.2.2.12.1 On the G&N Indicator Control Panel press and hold MARK pushbutton.

6.2.2.12.2 Observe PROG alarm lamp is lighted.

6.2.2.12.3 Enter the following in K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.2.2.12.4 Observe that DSKY row 1 displays 00040.

6.2.2.12.5 Release MARK pushbutton.

6.2.2.12.6 Observe that DSKY Row 1 displays 00000. Press RSET pushbutton.

6.2.2.12.7 Press and hold the REJECT pushbutton on the G&N Indicator Control Panel.

6.2.2.12.8 Observe PROG alarm lamp is lighted.

6.2.2.12.9 Observe that DSKY Row 1 displays 00100.

6.2.2.12.10 Release the REJECT pushbutton.

6.2.2.12.11 Observe that DSKY Row 1 displays 00000. Press RSET pushbutton.

6.2.2.12.12 On the DSKY perform the following operation:

VERB 36 ENTR

6.2.3 "Operate Power On" Test

6.2.3.1 IMU Operate Power ON

CAUTION: The sequences specified in this test must be adhered to. Deviations may necessitate recalibration of the inertial components.

NOTE: Disregard the GIMBAL LOCK indicator until the completion of Step 6.2.3.1.6.

6.2.3.1.1 The following Command Module switches and circuit breakers shall be in the following state:

Right Hand Circuit Breaker Panel

a. GUIDANCE/NAVIGATION COMPUTER MN A and MN B breakers on (pushed in)

b. GUIDANCE/NAVIGATION IMU HTR MN A and MN B breakers on (pushed in)

c. GUIDANCE/NAVIGATION IMU MN A and MN B breakers off (pulled out)

d. GUIDANCE/NAVIGATION OPTICS MN A and MN B breakers off (pulled out)
LEB Lighting Control Panel

e. G/N Power - IMU set to OFF

f. G/N Power - Optics set to OFF

6.2.3.1.2 Switches and selectors on the G&N Indicator control panel shall be set as follows:

a. OPTICS ZERO to OFF
b. OPTICS MODE to MANUAL
c. OPTICS COUPLING to DIRECT
d. OPTICS SPEED to MED
e. OPTICS TEL TRUN to SLAVE to SXT
f. RETICLE BRIGHTNESS to minimum brightness position

6.2.3.1.3 Adjust the Command Module MDC and LEB Lighting Controls to minimum intensity for proper readout of G&N Displays.

6.2.3.1.4 Set up the ACE analog recorders to monitor the following measurements (set chart speed to 5 mm/sec.):

a. CG 2117 IGA Servo Error In Phase
b. CG 2177 OGA Servo Error In Phase
c. CG 2147 MGA Servo Error In Phase
d. CG 2112 IG IX Resolver Output Sin
e. CG 2172 OG IX Resolver Output Sin
f. CG 2142 MG IX Resolver Output Sin
g. CG 1040 +120 VDC PIPA Supply DC Level

CAUTION: Before proceeding, insure that the G&N System has been operating in the STANDBY MODE (power configuration as defined in 6.2.3.1) for a minimum period of 2 hours. Exceptions to this requirement are noted in 6.2.5.2.9.

CAUTION NOTE: If the requirements of 6.2.3.1.6 are not met, remove IMU operate power immediately by placing the G/N POWER-IMU switch on the LEB Lighting Control Panel to OFF.

6.2.3.1.5 Perform the following sequence:

a. Turn on the IMU MN A and MN B circuit breakers on the Right Hand Circuit Breaker Panel (breakers pushed in).

b. Start Analog Recorders.

c. Place G/N Power - IMU switch on the LEB Lighting Control Panel to IMU (switch toggle up).

6.2.3.1.6 Immediately begin monitoring the following measurements.

a. The IMU Operate Power is +28.8±3 VDC (CG 1500). Verify on CRT.

b. On the recorders, verify that oscillations are not sustained and that a null is achieved within 10 seconds of power application in 6.2.3.1.5. on the following measurements:

CG 2112, IG IX Resolver Output Sin
CG 2142, MG IX Resolver Output Sin
CG 2172, OG IX Resolver Output Sin

6.2.3.1.6 (continued)

c. On the CRT, verify the absence of the +120 VDC PIPA supply (CG 1040) for a period of 90±10 seconds following power application in 6.2.3.1.5. Verify PIPA fail discrete is present during this period. After approximately 100 seconds, the voltage shall read +120±6 Vdc.

d. Stop the analog recorders.

6.2.3.1.7 Insure that the following alarm lamps are not lighted on G&N LEB Display Panel.

a. CMC Warning
b. ISS Warning
c. PGNS Caution

6.2.3.1.8 Verify that the PROG alarm lamp on the DSKY's does not light.

6.2.3.1.9 The OG, IG, and MG CDU angles shall be 00000±00150. Verify on CRT.

6.2.3.1.10 Enter the following into K-148:

a. VERB 41 NOUN 20, ENTER
b. +00000, ENTER
c. +00000, ENTER
d. +00000, ENTER

6.2.3.1.11 Verify that the following secondary power supply voltages are not flashing on the CRT display.

TABLE IV. SECONDARY POWER SUPPLY VOLTAGES

Meas. No.	Signal
1. CG 1041	+120 VDC PIPA SUPPLY
2. CG 1051	+20 VDC PIPA SUPPLY
3. CG 1052	-20 VDC PIPA SUPPLY
4. CG 1070	+4 VDC CDU SUPPLY
5. CG 1100	-28 VDC ELECTRONICS
6. CG 1021	+14 VDC CMC SUPPLY
7. CG 1030	+4 VDC CMC SUPPLY
8. CG 1201	IMU 28V 800 CPS 1 pct 0 ph
9. CG 1202	IMU 28V 800 CPS 5 pct ph A (-90°)
10. CG 1203	IMU 28V 800 CPS 5 pct ph B (0°)
11. CG 1331	3.2 KC 28V SUPPLY
12. CG 1110	2.5 VDC TM BIAS

6.2.3.1.12 The IMU Platform should not be moved during the Temperature Control Tests. 15 minutes after the application of IMU OPERATE power record PIPA TEMP (CG 2300) displayed on the CRT.

6.2.3.1.13 1 hour after the application of IMU OPERATE power monitor and record PIPA TEMP (CG 2300) every 5 minutes for 1 hour. Verify that each reading does not deviate from the average of each signal by more than 0.1°F.

6.2.3.1.14 When 2 hours have elapsed since the application of IMU OPERATE power record PIPA TEMP. PIPA TEMP shall be 130.5±1.5°F. PIPA TEMP shall be within 0.5°F of that recorded in 6.2.3.1.12 and 6.2.1.3.8.4.

6.2.3.2 Optics Power ON

6.2.3.2.1 Optics power shall be applied by actuating the G&N OPTICS MN A and OPTICS MN B breakers on the Right Hand Circuit Breaker Panel (breakers pushed in), and placing G/N Power - OPTICS switch on the LEB Lighting Control Panel to ON.

6.2.3.2.2 OPTICS +28 VDC discrete shall be issued (CG 1533). Verify by observing that the OPTICS lamp on Event Module is illuminated. Verify that the +28 VDC OPTX OPERATE BUS (CG 1530) is +28.8±3 VDC. Record the indication on the CRT.

6.2.3.2.3 Verify the following secondary power supply voltages on the CRT are not flashing:

CG 1211	OPTX 28V 800 CPS 1 pct 0 ph
CG 1212	OPTX 800 CPS 5 pct-90 ph

6.2.3.2.3.1 Set/verify OPTICS MODE on the G&N Indicator Control Panel to MAN.

6.2.3.2.3.2 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Indicator Panel to ZERO.

6.2.3.3 IMU Cage Test

6.2.3.3.1 Enter the following into the DSKY:

a. VERB 40 NOUN 20, ENTER (wait 3 seconds)
b. VERB 41 NOUN 20, ENTER
c. +00200, ENTER
d. +00200, ENTER
e. +00200, ENTER

Observe that the NO ATT lamps on the DSKY's light and that CDUX, CDUY, CDUZ on the CRT indicate approximately +00200.

6.2.3.3.2 Set up the Analog Recorder to monitor the following signals:

a. IG 1X Resolver Output Sine (CG 2112)
b. MG 1X Resolver Output Sine (CG 2142)
c. OG 1X Resolver Output Sine (CG 2172)

Start the Analog Recorders.

6.2.3.3.3 On MDC panel 1, press and hold the IMU CAGE switch in the CAGE position. On the Analog Recorder, verify that the 1X Sine signals (CG 2112, CG 2142, and CG 2172) null out at 0.5V rms or less.

6.2.3.3.4 Release the IMU CAGE switch. Disregard any momentary transients on the 1X Resolver Sine signals when the switch is released. Sustained oscillations shall be cause for immediate removal of IMU OPERATE power.

6.2.3.3.5 On the CRT verify that CDUX, CDUY and CDUZ are all between +00150 and +35850.

6.2.3.3.6 Stop the Analog Recorders.

6.2.4 G&N System Power Supplies Test

6.2.4.1 Proceed with this test if 6.2.3, Operate Power On Test, has been completed and system operation has not been interrupted. If system operation has been interrupted, perform 6.2.5.2, Turn On Procedure, before proceeding with this test. Insure that the IMU Operate Power has been on for at least 15 minutes before proceeding with this test.

6.2.4.2 Enter the following sequence into the K-Start. Verb 41 NOUN 20, ENTER; +00000 ENTER; +00000 ENTER; +00000 ENTER.

6.2.4.3 Set/Verify the following circuit breakers and switches on the Right Hand Circuit Breakers Panel and LEB.

a. COMPUTER MN A to ON (pushed in) and COMPUTER MN B to OFF (pulled out).
b. G/N - POWER to AC1
c. IMU HTR MN A to ON (pushed in) and IMU HTR MN B to OFF (pulled out).
d. IMU MN A to ON (pushed in) and IMU MN B to OFF (pulled out).
e. G/N POWER - IMU to IMU
f. OPTICS MN A to ON (pushed in) and OPTICS MN B to OFF (pulled out).
g. G/N POWER - OPTICS to OPTICS

6.2.4.4 Record the voltage indicated on the CRT for the following signals:

a. The +28 VDC IMU OPERATE (Bus No. 1) output voltage shall be +28.8±3 VDC (CG 1500).
b. The +28 VDC IMU STANDBY (Bus No. 2) output voltage shall be +28.8±3 VDC (CG 1510).
c. The +28 VDC CMC OPERATE (Bus No. 3) output voltage shall be +28.8±3 VDC (CG 1520).
d. The +28 VDC OPTX OPERATE (Bus No. 4) output voltage shall be +28.8±3 VDC (CG 1530).
e. The CG 2221, IGA CDU Coarse Error measurement shall be 0.0±0.68V rms.
f. The CG 2251 MGA CDU Coarse Error measurement shall be 0.0±0.68V rms.
g. The CG 2281 OGA CDU Coarse Error measurement shall be 0.0±0.68V rms.

6.2.4.5 Record the voltage indicated on the CRT for the following power supplies:

a. The +120 VDC PIPA Power Supply output voltage shall be 120±6 VDC (CG 1040).
b. The +20 VDC PIPA Power Supply output voltage shall be 20.0±1.2 VDC (CG 1051).
c. The -20 VDC PIPA Power Supply output voltage shall be -20±2 VDC (CG 1052).
d. The -28 VDC Electronics Power Supply output voltage shall be -28.5±6.0 VDC (CG 1100).

6.2.4.6 The following values shall be measured with the guidance reference clock synchronizing input pulse. Record the voltage indicated on the CRT.

a. IMU 28V, 800 CPS 1% 0 deg voltage shall be 28.0±0.6 VAC (CG 1201)
b. IMU 28V, 800 CPS 5% PHA - 90 deg. voltage shall be 28.0±1.4 VAC (CG1202).
c. IMU 28V, 800 CPS 5% PHB 0 deg. voltage shall be 28.0±2.1 VAC (CG 1203).
d. Optics 28V, 800 CPS 1% 0 deg voltage shall be 28.0±0.6 VAC (CG 1211).
e. Optics 28V, 800 CPS 5% - 90 deg voltage shall be 28.0±1.5 VAC (CG 1212).
f. PH Diff IMU 5% 0 deg. -90 deg. (CG 1207) phase difference shall be -90° ±10°.
g. PH Diff Optics 1% IMU 1% (CG 1220) phase difference shall be 0° ±10°.

6.2.4.7 Record the voltages indicated on the CRT for the following power supplies:

a. The +14 VDC CMC Power Supply output voltage shall be +14.0±0.4 VDC (CG 1020).
b. The +4 VDC CMC Power Supply output voltage shall be +4.0±0.2 VDC (CG 1030).
c. The +4 VDC CDU Power Supply output voltage shall be +4.0±0.2 VDC (CG 1070).
d. The +2.50 VDC TM BIAS SUPPLY output voltage shall be +2.50±0.06 VDC (CG 1110).

6.2.4.8 Record the CRT indications for the following measurements:

a. The 28V, 3200 CPS Power Supply feedback output voltage shall be 28.6±0.6V RMS (CG 1331).
b. The phase difference between the 3.2 Kc supply and CMC sync shall be 0° ±10° (CG 1336).
c. The +14 VDC CMC Power Supply rms noise shall be less than 0.2 vrms (CG 1021).
d. The +4 VDC CMC Power Supply rms noise shall be less than 0.2 vrms (CG 1031).

6.2.4.8.1 Enter the following into K-148:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+09000 ENTR
Wait 15 seconds.

6.2.4.9 Set/Verify the following circuit breakers and switches on the Right Hand Circuit Breaker Panel and LEB:

a. G/N POWER-OPTICS to OFF
b. OPTICS MN B to ON (pushed in) and OPTICS MN A to OFF (pulled out)
c. G/N POWER - IMU to OFF
d. IMU MN B to ON (pushed in) and IMU MN A to OFF (pulled out)
e. IMU HTR MN A to OFF (pulled out)
f. G/N - POWER to OFF
g. COMPUTER MN B to ON (pushed in) and COMPUTER MN A to OFF (pulled out)

6.2.4.10 Verify that the +28 VDC CMC OPERATE output voltage is +28.8±3 VDC (CG 1520).

6.2.4.11 Set the G/N - POWER switch on the LEB to AC2. Set the IMU HTR MN B to ON (pushed in). Verify that the +28 VDC IMU STANDBY output voltage is +28.8±3 VDC (CG 1500).

6.2.4.12 Wait until 15 minutes have elapsed since setting G/N POWER - IMU to OFF in 6.2.4.9.c then set the G/N POWER - IMU to IMU. Verify that the +28 VDC IMU OPERATE output voltage is +28.8±3 VDC (CG 1500).

6.2.4.13 Set the G/N POWER - OPTICS to OPTICS. Verify that the +28 VDC OPTX OPERATE output voltage is +28.8±3 VDC (CG 1530).

6.2.4.14 Repeat 6.2.4.5 through 6.2.4.8.

6.2.4.15 Set the following circuit breakers to the position indicated:

a. Set the COMPUTER MN A to ON (pushed in).
b. Set the IMU HTR MN A to ON (pushed in).
c. Set the IMU MN A to ON (pushed in).
d. Set the OPTICS MN A to ON (pushed in).

6.2.4.16 Miscellaneous Checks - The following miscellaneous signals are required to supply data for system evaluation in the event of failure, or for trend analysis of system performance. Record the values displayed on the CRT for the following signals.

a.	CG 4300	CMC Temperature
b.	CG 6020	PIPA Calibration Module Temperature
c.	CG 6021	IMU 800 CPS 5% Temperature

6.2.4.17 Verify and record the following signals displayed on the CRT:

a. +120 VDC PIPA SUP NOISE RMS shall be less than 1.5 VRMS (CG 1042).
b. +20 VDC PIPA SUP NOISE RMS shall be less than 1.0 VRMS (CG 1053)
c. +4 VDC CDU SUP NOISE RMS shall be less than 0.1 VRMS (CG 1071).
d. +28V IMU OPERATE BUS NOISE RMS shall be less than 1.0 VRMS (CG 1501)
e. +28V IMU STANDBY BUS NOISE RMS shall be less than 1.0 VRMS (CG 1511).
f. +28V CMC OPERATE BUS NOISE RMS shall be less than 2.0 VRMS (CG 1521)
g. +28V OPTX OPERATE BUS NOISE RMS shall be less than 2.0 VRMS (CG 1531).

6.2.4.18 The noise peaks of the following signals are demonstrated on the event light when the peaks have a rise time between 2 and 50 μsec and the peak voltage exceeds 5 volts.

6.2.4.18 (continued)	a.	+14V CMC SUPPLY NOISE PEAKS	(CG 1022)
	b.	+4V CMC SUPPLY NOISE PEAKS	(CG 1032)
	c.	+120 VDC PIPA SUPPLY NOISE PEAKS	(CG 1043)
	d.	+4 VDC CDU SUPPLY NOISE PEAKS	(CG 1072)
	e.	+28V IMU OPERATE BUS NOISE PEAKS	(CG 1502)
	f.	+28V IMU STANDBY BUS NOISE PEAKS	(CG 1512)
	g.	+28V CMC OPERATE NOISE PEAKS	(CG 1522)
	h.	+28V OPTX OPERATE NOISE PEAKS	(CG 1532)

6.2.4.19 If Optics Testing will not continue, set the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OFF.

6.2.5 General Turn Off and Turn On Procedure

NOTE: The procedure shall be utilized any time after performing 6.2.1, Standby Power On Test and 6.2.3, Operate Power On Test to turn on or turn off the G&N Systems. Appropriate portions of this procedure will be referenced in other tests.

6.2.5.1 Turn Off Procedure.

CAUTION: This procedure must be performed in the sequence specified. Failure to adhere to this sequence may require calibration of the inertial components.

6.2.5.1.1 Enter the following sequence into K-148:

a. VERB 41 NOUN 20, ENTER
b. +00000 ENTR
c. +00000 ENTR
d. +09000 ENTR

Verify that the GIMBAL LOCK indicator on the DSKY'S is illuminated. On the G&N Indicator Control Panel verify PGNS light is ON. On the DSKY verify NO ATT light is ON.

6.2.5.1.2 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the following switches on the G&N Indicator Control Panel to the positions designated.

a. OPTICS ZERO to ZERO
b. OPTICS MODE to MANUAL
c. OPTICS COUPLING to DIRECT
d. OPTICS SPEED to MED
e. OPTICS TEL TRUN to SLAVE to SXT
f. RETICLE BRIGHTNESS to minimum brightness position

6.2.5.1.3 Set the G/N Power - IMU switch on the LEB Lighting Control Panel to OFF and G&N IMU MN A and MN B circuit breakers on the Right Hand Circuit Breaker panel to OFF (breakers pulled out).

6.2.5.1.3.1 On K-148 enter the following:

VERB 21 NOUN 01 ENTR
00034 ENTR
00000 ENTR
Verify GIMBAL LOCK lamp goes out.

V

6.2.5.1.3.1 (continued)

VERB 21 NOUN 01 ENTR
00773 ENTR
40000 ENTR

Verify that NO ATT indication is OFF.

6.2.5.1.4 Set the G&N Power AC1-OFF-AC2 Switch on the Right Hand Circuit breaker panel to OFF and the G&N POWER AC1 and AC2 circuit breakers to OFF (breakers pulled out).

6.2.5.1.5 Decrease the LIGHTS - NUMERICS controls on both the Left Hand Circuit Breaker panel and the LEB Lighting Control Panel to the minimum brightness - OFF position.

6.2.5.1.6 Set the PSAAM power switch on the PSAAM to OFF.

6.2.5.1.7 Set the IMU HTR MN A and MN B circuit breaker on the Right Hand Circuit Breaker panel to OFF (breakers pulled out).

6.2.5.1.8 Set the G/N POWER - OPTICS switch on the LEB Lighting Control Panel to OFF and G&N OPTICS MN A and MN B breakers on the Right Hand Circuit breaker panel to OFF.

6.2.5.1.9 Set the COMPUTER MN A and MN B Circuit breakers on the Right Hand Circuit Breaker panel to OFF (breakers pulled out).

6.2.5.1.10 Verify that the PTC is supplying inertial components heater power to the G&N System. This will be indicated by the following on the PTC.

a. G&N ON (PTC inhibit) light not illuminated.
b. IMU Temp/heater current meter indicates IMU temperature of 130° ±5°F.

6.2.5.2 Turn ON Procedure

6.2.5.2.1 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set or verify the following G&N Indicator Control Panel switches to the position indicated.

a. CONDITION LAMPS to ON
b. OPTICS ZERO to ZERO
c. OPTICS MODE to MANUAL
d. OPTICS COUPLING to DIRECT
e. OPTICS SPEED to LO
f. OPTICS TEL TRUN to SLAVE to SXT
g. RETICLE BRIGHTNESS to minimum brightness position.

6.2.5.2.2 Insure that interfacing system EPS and ECS are turned on and operating properly.

CAUTION: The remaining procedure must be followed in sequence specified. Failure to adhere to this sequence may require recalibration of the inertial components.

6.2.5.2.3 Energize the G&N COMPUTER MN A and MN B breakers on the Right Hand Circuit Breaker panel (breakers pushed in). Press the STBY pushbutton on the DSKY for approximately 3 seconds. Verify +14 and +4 VDC AGC power supply outputs on CRT display. Voltages shall be +14±0.4V (CG 1020) and +4±0.2 (CG1030). On DSKY verify TEMP light is ON.

6.2.5.2.4 Set the G&N POWER AC1 and AC2 breakers on the Right Hand Circuit Breaker Panel to ON (breakers pushed in). Set the G&N POWER AC1-OFF-AC2 switch to AC1.

6.2.5.2.4.1 Set the G&N DSKY and Display Panel brightness to the minimum acceptable level by manipulation of LIGHTS - NUMERICS control on both Left Hand Circuit breaker panel and LEB Lighting Control panel.

6.2.5.2.5 Energize the G&N IMU HTR, MN A and MN B breakers on the Right Hand Circuit Breaker panel (breakers pushed in). Insure that the CMC +28 VDC discrete lamp on the Event Module is illuminated (CG 1523). Verify TEMP light on DSKY is extinguished.

6.2.5.2.5.1 Set/Verify the following switches on the PSAAM.

a. PSAAM PWR to ON
b. INHIBIT VOLTAGE FAIL to OFF.

6.2.5.2.6 Enter VERB 36 ENTER into K148. Press ERROR RESET pushbutton on K148. All computer alarms on the Main Display Console (MDC) and LEB AGC DSKY shall clear. Verify that DSKY R1, R2, R3, VERB, NOUN and PROG indications are blank.

6.2.5.2.7 Verify K-START tape F09C103-K10538-XXCM Self-Check Test is on the K-START tape reader.

6.2.5.2.8 Start tape reader.

6.2.5.2.9 When tape reader stops, verify:

R1 = +09XXX
R2 = +10538 tape number
R3 = -000XX tape Rev. No.

6.2.5.2.10 Start tape reader.

6.2.5.2.11 When tape reader stops, verify:

R1 = 00101

6.2.5.2.12 Start tape reader

6.2.5.2.13 Monitor DSKY until R2 (SCOUNT+1) increments twice. If an error is detected, the PROG alarm lamp on the DSKY shall light.

6.2.5.2.14 On K-148, enter the following to turn off Self-Check:

VERB 21 NOUN 27 ENTR
00000 ENTR
VERB 34 ENTR

6.2.5.2.15 NOTE: Allow 2 hours to elapse before proceeding, with the following exceptions:

a. If the G&N System has been in the power off state for less than 5 days with the gimbals in the parked position (0°, 0°, 90°) and the system has not been moved, allow 15 minutes to elapse before proceeding.

b. If the G&N System has been turned off with the gimbals in the unparked position for less than 2 hours allow a warmup time equal to the time off but not less than 15 minutes to elapse before proceeding.

CAUTION: If the requirements of 6.2.5.2.16 are not met, remove IMU Operate Power immediately by setting the G/N POWER-IMU switch on the LEB Lighting Control Panel to OFF.

After the required warmup time has elapsed set the G&N IMU MN A and MN B circuit breaker on the Right Hand circuit breaker panel to ON (breaker pushed in), and the G/N POWER - IMU switch on the LEB Lighting Control panel to the IMU position (toggle up).

6.2.5.2.16 Immediately begin monitoring the following measurements.

a. On the CRT verify that IMU Operate Power is +28.0±3 VDC (CG 1500).

b. On the meter modules verify that oscillations are not sustained and that a null is achieved within 10 seconds of power application on the following measurements:

CG 2112	IG 1X Resolver Output Sin
CG 2142	MG 1X Resolver Output Sin
CG 2172	OG 1X Resolver Output Sin

c. On the CRT verify the absence of the +120 VDC PIPA Supply (CG 1040) for a period of 90±10 seconds following power application. After approximately 100 seconds, the voltage shall read +120±6 VDC.

6.2.5.2.17 Verify that the PROG alarm lamp on the DSKY's does not light.

6.2.5.2.18 Enter VERB 40, NOUN 20, ENTER into K148. Wait 15 seconds.

6.2.5.2.19 On K-148 enter the following

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.5.2.20 Set the G&N OPTICS MN A and MN B circuit breakers on the Right Hand Circuit breaker panel to the ON position (breaker pushed in).

6.2.5.2.21 Verify that the CRT indications of the signals in Table V are not flashing.

Table V. Secondary Power Supply Voltages

	Measurement Number	Signal
1.	CG 1040	+120 VDC PIPA SUPPLY
2.	CG 1051	+20 VDC PIPA SUPPLY
3.	CG 1052	-20 VDC PIPA SUPPLY
4.	CG 1070	+4 VDC CDU SUPPLY
5.	CG 1100	-28 VDC ELECTRONICS
6.	CG 1020	+14 VDC CMC SUPPLY
7.	CG 1030	+4 VDC CMC SUPPLY
8.	CG 1201	IMU 28V 800 CPS 1 pct 0 pha
9.	CG 1202	IMU 28V 800 CPS 5 pct ph A
10.	CG 1203	IMU 28V 800 CPS 5 pct ph B
11.	CG 1331	3.2 KC 28V SUPPLY
12.	CG 1110	2.5 VDC TM BIAS
13.	CG 2301	IRIG TEMPERATURE

6.2.5.2.22 Monitor the PIPA Display Scope to insure that each PIPA is moding properly.

6.2.5.2.23 Perform 6.2.6 G&N Operational Test.

6.2.6 G&N Operational Test

6.2.6.1 Verify K-START tape F09C103-K10531-XXCM G/N OPCHK is on K-START tape reader.

6.2.6.1.1 Start tape reader.

6.2.6.1.2 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +09XXX
b. R2 = +10531
c. R3 = -000XX

6.2.6.2 E-Memory Program Load and Sum Check.

6.2.6.2.1 Start tape reader.

6.2.6.2.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00101.

6.2.6.3 Local g Measurement.

6.2.6.3.1 Start tape reader.

6.2.6.3.2 In approximately 10 minutes, VERB 06 NOUN 98 shall flash.

6.2.6.3.3 From the CRT DSKY display read and record Row 1 and Row 2 (local gravity whole and fractional, respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.2.6.4 Horizontal Earth Rate Measurement.

6.2.6.4.1 Press PRO pushbutton on DSKY.

6.2.6.4.2 In approximately 2 seconds VERB 06 NOUN 98 shall flash. From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.2.6.5 Enter the following on K-148:

VERB 34	ENTR
VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR

6.2.7 Gimbal Friction Test

6.2.7.1 Enter the following sequence into K-148:

```
VERB 41        NOUN 20        ENTR
+00000                        ENTR
+00000                        ENTR
+00000                        ENTR
Wait 15 seconds
VERB 41        NOUN 20        ENTR
+17000                        ENTR
+17000                        ENTR
+17000                        ENTR
Wait 15 seconds
VERB 41        NOUN 20        ENTR
+27000                        ENTR
+27000                        ENTR
+27000                        ENTR
Wait 15 seconds
VERB 41        NOUN 20        ENTR
+00000                        ENTR
+00000                        ENTR
+00000                        ENTR
Wait 15 seconds
```

6.2.7.2 Inner Gimbal Friction Test

6.2.7.2.1 Set up the ACE Analog Recorders to record the following measurements:

a.	CG 2120	IG TORQUE MOTOR CURRENT
b.	CG 2117	IGA SERVO ERROR IN PHASE
c.	CG 2112	IG 1X RESOLVER OUTPUT SIN
d.	CG 2113	IG 1X RESOLVER OUTPUT COS
e.	CG 2220	IGA CDU FINE ERROR
f.	CG 2221	IGA CDU Coarse Error

6.2.7.2.2 Enter the following sequence into K-148: (+360 IG torquing)

```
VERB 21        NOUN 01        ENTR
02757                         ENTR
00000                         ENTR
NOUN 15                       ENTR
00000                         ENTR/ENTR
40000                         ENTR/ENTR
40034                         ENTR/ENTR
00000                         ENTR/ENTR
00000                         ENTR
```

6.2.7.2.3 Enter the following sequence into K-148:

VERB 42 ENTR
VERB 33 ENTR

6.2.7.2.4 Start analog recorders.

6.2.7.2.5 Verify that IG Servo Error Quadrature (CG 2108) is 0.0±1.2V rms. Observe measurement CG 2112, IG 1X Resolver output SIN, on the analog recorder. When steady-state condition occurs, with the reading near zero (approximately 12 minutes), stop the recorders.

6.2.7.2.6 Return the G&N System to the coarse align mode by entering the following sequence in K-148:

VERB 40 NOUN 20 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.2.7.2.7 Wait 15 seconds before proceeding.

6.2.7.2.8 Enter the following sequence into K-148: (-360° IG torquing)

VERB 24 NOUN 01 ENTR
02761 ENTR
37777 ENTR
37743 ENTR

6.2.7.2.9 Enter the following sequence into K-148:

VERB 42	ENTR
VERB 33	ENTR

6.2.7.2.10 Start analog recorders.

6.2.7.2.11 Observe measurement CG 2112, IG 1X Resolver output SIN, on the analog recorder. When steady-state condition occurs, with the reading near zero (approximately 12 minutes), stop the recorders.

6.2.7.2.12 Return the G&N System to the coarse align mode by entering the following sequence into K-148:

VERB 40	NOUN 20	ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+17000		ENTR
+17000		ENTR
+17000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+27000		ENTR
+27000		ENTR
+27000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000	ENTR	
+00000	ENTR	
+00000	ENTR	

6.2.7.2.13 Wait 15 seconds before proceeding.

6.2.7.3 Outer Gimbal Friction Test.

6.2.7.3.1 Set up the ACE Analog Recorders to record the following measurements:

a. CG 2180 OG TORQUE MOTOR CURRENT
b. CG 2177 OGA SERVO ERROR IN PHASE
c. CG 2172 OG 1X RESOLVER OUTPUT SIN
d. CG 2173 OG 1X RESOLVER OUTPUT COS
e. CG 2280 OGA CDU FINE ERROR
f. CG 2281 OGA CDU Coarse Error

6.2.7.3.2 Enter the following sequence into K-148: (+360° OG torquing)

VERB 24	NOUN 01	ENTR
02757	ENTR	
40000	ENTR	
40034	ENTR	

6.2.7.3.3 Enter the following sequence into K-148:

VERB 42	ENTR
VERB 33	ENTR

6.2.7.3.4 Start analog recorders.

6.2.7.3.5 Verify that OG Servo Error Quadrature (CG 2168) is 0.0±1.2V rms. Observe measurement CG 2172, OG 1X Resolver output SIN, on the analog recorder. When steady-state condition occurs, with the reading near zero (approximately 12 minutes), stop the recorders.

6.2.7.3.6 Return the G&N System to the coarse align mode by entering the following sequence into K-148:

VERB 40	NOUN 20	ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+17000		ENTR
+17000		ENTR
+17000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+27000		ENTR
+27000		ENTR
+27000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000	ENTR	
+00000	ENTR	
+00000	ENTR	

6.2.7.3.7 Wait 15 seconds before proceeding.

6.2.7.3.8 Enter the following sequence into K-148: (-360° OG torquing)

VERB 24	NOUN 01	ENTR
02757	ENTR	
37777	ENTR	
37743	ENTR	

6.2.7.3.9 Enter the following sequence into K-148:

VERB 42	ENTR
VERB 33	ENTR

6.2.7.3.10 Start analog recorders.

6.2.7.3.11 Observe measurement CG 2172, OG 1X resolver output SIN, on the analog recorder. When steady-state condition occurs, with the reading near zero (approximately 12 minutes), stop the recorder.

6.2.7.3.12 Return the G&N System to the coarse align mode by entering the following sequence into K-148:

VERB 40	NOUN 20	ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+17000		ENTR
+17000		ENTR
+17000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+27000		ENTR
+27000		ENTR
+27000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000	ENTR	
+00000	ENTR	
+35750	ENTR	

6.2.7.3.13 Wait 15 seconds before proceeding.

6.2.7.4 Middle Gimbal Friction Test.

6.2.7.4.1 Set up the ACE Analog Recorders to record the following measurements

a. CG 2140 MG TORQUE MOTOR CURRENT
b. CG 2147 MGA SERVO ERROR IN PHASE
c. CG 2142 MG 1X RESOLVER OUTPUT SIN
d. CG 2143 MG 1X RESOLVER OUTPUT COS
e. CG 2250 MGA CDU FINE ERROR
f. CG 2251 MGA CDU Coarse Error

6.2.7.4.2 Enter the following sequence into K-148: (+135° MG torquing)

VERB 24	NOUN 01	ENTR
02763	ENTR	
63777	ENTR	
77777	ENTR	

6.2.7.4.3 Entr the following sequence into K-148:

VERB 42	ENTR
VERB 33	ENTR

6.2.7.4.4 Start the analog recorder.

6.2.7.4.5 Verify that MG Servo Error Quadrature (CG 2138) is 0.0±1.2V rms. Observe measurement CG 2142, MG 1X Resolver output SIN, on the analog recorder. When steady-state condition occurs (approximately 5 minutes), stop the recorders.

6.2.7.4.6 Return the G&N System to the coarse align mode by entering the following sequence into K-148:

VERB 40 NOUN 20, ENTR
Wait 15 seconds

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

Wait 15 seconds

VERB 41	NOUN 20	ENTR
+17000		ENTR
+17000		ENTR
+17000		ENTR

Wait 15 seconds

6.2.7.4.6 (continued)

VERB 41	NOUN 20	ENTR
+27000		ENTR
+27000		ENTR
+27000		ENTR
Wait 15 seconds		
VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR
Wait 15 seconds		
+00000	ENTR	
+00000	ENTR	
+06750	ENTR	

6.2.7.4.7 Enter the following sequence into K-148: (-135° MG torquing)

VERB 24	NOUN 01	ENTR
02763	ENTR	
14000	ENTR	
00000	ENTR	

6.2.7.4.8 Enter the following sequence into K-148:

VERB 42	ENTR
VERB 33	ENTR

6.2.7.4.9 Start analog recorders.

6.2.7.4.10 Observe measurement CG 2142, MG 1X Resolver output SIN, on the analog recorder. When the steady-state condition occurs (approximately 5 minutes), stop the recorders.

6.2.7.4.11 Return the G&N System to the coarse align mode by entering the following sequence into K-148:

VERB 40	NOUN 20	ENTR
VERB 41	NOUN 20	ENTR
+00000	ENTR	
+00000	ENTR	
+00000	ENTR	

6.2.7.5 Examine the traces of the recorded measurements for all six phases of this test to detect any sharp discontinuities. Disregard transients of 0.5 second duration or less on the Gimbal Torque motor current traces, disregard transients on the CDU fine error and CDU coarse error measurement traces. The Gimbal Torque motor currents shall not exceed 0.125 ampere. The CDU Fine Error measurements shall not exceed ±70 mv rms. The CDU Coarse Error measurement shall not exceed ±680 mv rms.

6.2.8 G&N Panel Brightness and Lamp Test

6.2.8.1 Proceed with this test if 6.2.5.2 or 6.2.3 has been performed and system operation has not been interrupted. If system operation has been interrupted, perform 6.2.5.2 before proceeding with this test.

6.2.8.2 Rotate the RETICLE BRIGHTNESS thumbwheel on the Control Indicator Panel and verify the capability to control the illumination of the following lamps:

a. SCT reticles
b. SXT reticles
c. Telescope Panel Angle Counters

6.2.8.3 Turn on LIGHTS-INTEGRAL control on Left Hand Circuit Breaker panel and LEB Lighting Control Panel.

6.2.8.4 Adjust the brightness controls on the LEB Lighting Control Panel and Left Hand Circuit Breaker Panel from minimum brightness to maximum brightness. Verify the operation of the G&N Indicator Control Panel lamps.

6.2.8.4.1 Re-adjust brightness controls for minimum acceptable lighting. Turn off LIGHTS-INTEGRAL control on Left Hand Circuit Breaker panel and LEB Lighting Control Panel.

6.2.8.5 Push and hold the CONDITION LAMPS switch on the G&N Indicator Control Panel to TEST. Verify the illumination of the following lamps:

a. STAR ACQ
b. MASTER ALARM lamp

6.2.8.6 Set the CONDITION LAMPS switch to ON. Lamps a and b in 6.2.8.5 shall extinguish.

6.2.9 **Semi-Automatic Mode Test**

6.2.9.1 Verify K-START Tape F09C103-K10530-XX CM Semi-Automatic Mode Test is on K-START tape reader.

6.2.9.1.1 Start tape reader.

6.2.9.1.2 When tape reader stops verify the following on CRT DSKY

a. R1 = +09XXX
b. R2 = +10530
c. R3 = -000XX

6.2.9.2 E-Memory Program Load

6.2.9.2.1 Start tape reader.

6.2.9.2.2 When tape reader stops verify the following on CRT DSKY:

R1 = 00101

6.2.9.3 Command Accuracy 0°.

6.2.9.3.1 Start tape reader

6.2.9.3.2 When tape stops verify that CRT DSKY R1 indicates 00201. Wait 15 seconds.

6.2.9.3.3 Read and record CRT IMU Gimbal angles. The indications shall be 000±003 degrees.

6.2.9.3.4 Read and record CRT CDU angle indications. The indications shall be +000.00±001.50.

6.2.9.4 Command Accuracy 45°.

6.2.9.4.1 Start tape reader.

6.2.9.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00301. Wait 5 seconds.

6.2.9.4.3 Read and record CRT IMU Gimbal angles. The indications shall be 045±003 degrees.

6.2.9.4.4 Read and record CRT CDU angle indications. Indications shall be +045.00±001.50.

6.2.9.5 CDU Repeating Accuracy 45°.

6.2.9.5.1 Start the tape reader.

6.2.9.5.2 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.6 Command accuracy 90°.

6.2.9.6.1 Start tape reader.

6.2.9.6.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00501. GIMBAL LOCK lamp will be lighted. Wait 5 seconds.

6.2.9.6.3 Read and record CRT indication of IMU Gimbal angles. The indications shall be 090±003 degrees.

6.2.9.6.4 Read and record CRT CDU angle indications. Indications shall be +090.00±001.50.

6.2.9.7 Command Accuracy 135°.

6.2.9.7.1 Start tape reader.

6.2.9.7.2 When tape reader stops verify CRT DSKY Row 1 indicates 00601. Wait 5 seconds.

6.2.9.7.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 135±003 degrees.

6.2.9.7.4 Read and record CRT CDU angle indications. Indications shall be +135.00±001.50.

6.2.9.8 CDU Repeating Accuracy 135°.

6.2.9.8.1 Start tape reader.

6.2.9.8.2 When tape reader stops verify CRT DSKY Row 1 indicates 00701. Wait 10 seconds, verify GIMBAL LOCK lamp on DSKY is not lighted.

6.2.9.8.3 Start tape reader.

6.2.9.8.4 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 will flash. Read and record CRT DSKY Row 1, 2 and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.9 Plus Gimbal Lock Test.

6.2.9.9.1 Start tape reader.

6.2.9.9.2 When tape reader stops wait approximately 10 seconds. Verify CRT DSKY Row 1 indicates 01101. Verify GIMBAL LOCK lamp is lighted.

6.2.9.10 Command Accuracy 225°.

6.2.9.10.1 Start tape reader.

6.2.9.10.2 When tape reader stops verify CRT DSKY Row 1 indicates 01201. GIMBAL LOCK lamp will be lighted. Wait 15 seconds.

6.2.9.10.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 225±003 degrees.

6.2.9.10.4 Read and record CRT CDU angle indications. Indications shall be +225.00±001.50.

6.2.9.11 ISS CDU Command Rate Test

6.2.9.11.1 Start tape reader.

6.2.9.11.2 When tape reader stops verify CRT DSKY display Row 1 indicates 01301. Wait 10 seconds. Verify IMU Gimbals are at approximately 0°.

6.2.9.11.3 Middle Gimbal Rate Test

6.2.9.11.3.1 Start tape reader.

6.2.9.11.3.2 When tape reader stops immediately verify display of 01401 in Row 1 of CRT DSKY display. In approximately 12 seconds VERB 23 NOUN 26 shall flash. The GIMBAL LOCK lamp shall be lit. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.2.9.11.4 Inner Gimbal Rate Test

6.2.9.11.4.1 Start tape reader.

6.2.9.11.4.2 Approximately 12 seconds after the tape reader stops VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.2.9.11.5 Outer Gimbal Rate Test.

6.2.9.11.5.1 Start tape reader.

6.2.9.11.5.2 Approximately 12 seconds after the tape reader stops VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.2.9.11.6 Start tape reader.

6.2.9.11.6.1 Wait 15 seconds. Verify IMU Gimbals are at approximately 0°.

6.2.9.12 Command Accuracy 315°.

6.2.9.12.1 Start tape reader.

6.2.9.12.2 When tape reader stops verify CRT DSKY Row 1 indicates 01501.

6.2.9.12.3 Read and record CRT IMU Gimbal Angles. Indication shall be 315±003 degrees.

6.2.9.12.4 Read and record CRT CDU angle indications. Indications shall be +315.00±001.50.

6.2.9.13 CDU Repeating Accuracy 315°.

6.2.9.13.1 Start tape reader.

6.2.9.13.2 Approximately 5 seconds after the tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.14 Minus Gimbal Lock Test.

6.2.9.14.1 Start tape reader.

6.2.9.14.2 When tape reader stops verify CRT DSKY Row 1 indicates 01701. Verify GIMBAL LOCK lamp is lighted after approximately 5 seconds.

6.2.9.15 CDU Repeating Accuracy 225°.

6.2.9.15.1 Start tape reader.

6.2.9.15.2 When tape reader stops verify CRT DSKY Row 1 indicates 02001. Wait 10 seconds before continuing.

6.2.9.15.3 Start tape reader.

6.2.9.15.4 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 will flash. Read and record CRT DSKY Row 1, 2 and 3 indications. Recorded values shall be between 77770 and 00007.

6.2.9.16 OG CDU Fine Fail Test.

6.2.9.16.1 Start tape reader.

6.2.9.16.2 When tape reader stops verify CRT DSKY Row 1 indicates 02101.

6.2.9.16.3 Start tape reader.

6.2.9.16.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.16.5 Start tape reader.

6.2.9.16.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.17 IG CDU Fine Fail Test

6.2.9.17.1 Start tape reader.

6.2.9.17.2 When tape reader stops verify CRT DSKY Row 1 indicates 02201.

6.2.9.17.3 Start tape reader.

6.2.9.17.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.17.5 Start tape reader.

6.2.9.17.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.18 MG CDU Fine Fail Test.

6.2.9.18.1 Start tape reader.

6.2.9.18.2 When tape reader stops verify CRT DSKY Row 1 indicates 02301.

6.2.9.18.3 Start tape reader.

6.2.9.18.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.18.5 Start tape reader.

6.2.9.18.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.19 OG CDU Coarse Fail Test

6.2.9.19.1 Start tape reader.

6.2.9.19.2 When tape reader stops verify CRT DSKY Row 1 indicates 02401.

6.2.9.19.3 Start tape reader.

6.2.9.19.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.19.5 Start tape reader.

6.2.9.19.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.20 IG CDU Coarse Fail Test

6.2.9.20.1 Start tape reader.

6.2.9.20.2 When tape reader stops verify CRT DSKY Row 1 indicates 02501.

6.2.9.20.3 Start tape reader.

6.2.9.20.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.20.5 Start tape reader.

6.2.9.20.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.21 MG CDU Coarse Fail Test

6.2.9.21.1 Start tape reader.

6.2.9.21.2 When tape reader stops verify CRT DSKY Row 1 indicates 02601.

6.2.9.21.3 Start tape reader.

6.2.9.21.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAIL REG on CRT displays 03777.

6.2.9.21.5 Start tape reader.

6.2.9.21.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.2.9.22 Optics CDU Command Rate Test.

6.2.9.22.1 Set the G/N POWER - OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify OPTX BUS, 28V 800~ 1% and 5% Power Supplies.

6.2.9.22.2 Set the OPTICS COUPLING switch on the G&N Panel to DIRECT. Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +5 degrees of zero as indicated by the TPAC (Telescope Trunnion Slaved to SXT). Set the OPTICS ZERO switch to ZERO.

6.2.9.22.3 Shaft Slew Rate Test.

6.2.9.22.3.1 Start tape reader.

6.2.9.22.3.2 In approximately 25 seconds VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 00018.88000 and 00011.32000.

6.2.9.22.4 Trunnion Slew Rate Test

6.2.9.22.4.1 Start tape reader.

6.2.9.22.4.2 In approximately 15 seconds VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 00004.71000 and 00002.83000.

6.2.9.23 Test Termination

6.2.9.23.1 Start tape reader.

6.2.10 Zero Optics Test

6.2.10.1 Set the G&N POWER-OPTICS switch on the LEB to OPTICS. Verify Power Supplies.

NOTE: Proceed with this test if 6.2.3 Operate Power on test has been completed and system operation has not been interrupted. If system operation has been interrupted perform 6.2.5.2. Turn On Procedure before proceeding.

INITIALIZATION

6.2.10.2 Insure that the following switches on the G&N Indicator Control Panel are set as follows:

a. OPTICS TEL TRUN to SLAVE to SXT
b. OPTICS COUPLING to DIRECT
c. OPTICS SPEED to HI
d. OPTICS MODE to MAN

OPTICS ZERO MODE TEST

6.2.10.3 Monitor the Optics CDU's by entering VERB 16 NOUN 91 ENTER into K-148.

6.2.10.4 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Indicator Control Panel to ZERO. Wait 15 seconds. Verify the Optics have zeroed properly by observing the following on R1 and R2 of the CRT.

a. R1 = +0.00° +0.02°, -0.03° (Shaft Angle)
b. R2 = +0.000° +0.006°, -0.007° (Trunnion Los Angle)

6.2.10.4.1 Enter the following:

VERB 01 NOUN 10, ENTER
00033 ENTER

Verify R1 = XXX6X

6.2.10.4.2 Set the OPTICS ZERO switch to OFF and the OPTICS MODE switch to CMC. Enter the following:

ENTER
00033, ENTER

Verify R1 = XXX5X

6.2.10.4.3 Set the OPTICS MODE switch to MAN. Press the KEY-REL pushbutton.

OPTICS BACKUP MODE TEST

6.2.10.5 Insert the Inflight Tool (V36601405) into the Trunnion Tool input and engage drive mechanism (button out). Verify that the trunnion turns by viewing the movement through the SCT eyepiece while turning the tool until the TPAC reads +5°. Remove the tool from the Trunnion tool input.

6.2.10.6 Insert the Inflight Tool (V36601405) into the Shaft Tool input and engage the drive mechanism (button out). Verify that the Shaft turns by viewing the movement through the SCT eyepiece while turning the tool so that the shaft moves through an angle from 0° to +3° to 0° as indicated on the shaft TPAC. Disengage the shaft drive mechanism (button in) and remove the tool.

6.2.10.7 Insert the Inflight Tool (V36601405) into the Trunnion Tool input. Verify that the Trunnion turns by viewing the movement through the SCT eyepiece while turning the tool so that the trunnion moves from +5° to -5° and back to zero as indicated on the Trunnion TPAC. Disengage the trunnion drive mechanism (button in) and remove the tool.

6.2.11 Optics Coordinate Transformation Control Test.

6.2.11.1 Set the G/N POWER-OPTICS switch on the LEB to OPTICS. Verify Power Supplies.

NOTE: Proceed with this test if 6.2.3 Operate Power On Test has been completed and system operation has not been interrupted. If system operation has been interrupted, perform 6.2.5.2, Turn On Procedure, before proceeding.

INITIALIZATION

6.2.11.2 Verify and/or set the following switches on the G&N Indicator Control Panel to the position indicated.

a. OPTICS TEL TRUN to SLAVE to SXT
b. OPTICS COUPLING to DIRECT
c. OPTICS SPEED to HI
d. OPTICS MODE to MAN

6.2.11.3 Enter the following into K-148:

VERB 16 NOUN 91 ENTR

6.2.11.4 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Panel to ZERO. Wait 15 seconds. Return the OPTICS ZERO switch to OFF.

6.2.11.5 Set up the analog recorders to monitor the following measurements:

a. CG 3170 SCT Trunnion Tachometer Output

RESOLVED MODE PHASING AND IMAGE RATE TEST.

6.2.11.6 Using the OPTICS CONTROL STICK, drive the Optics until R1 = +225.00 and R2 = +10.000 on the CRT and the DSKY's.

6.2.11.7 Set the OPTICS COUPLING switch on the G&N Panel to RSLV and the OPTICS Speed switch to MED.

6.2.11.8 Position the movable optics target such that it is centered on the SCT reticle pattern.

6.2.11.9 Record time. Quickly displace the OPTICS CONTROL STICK 45±10 degrees in the upper right hand quadrant while sighting on the optics target through the SCT eyepiece. The target shall appear to move in the upper right field of view of the SCT at 45±10 deg. When target leaves the SCT upper right field of view press MARK pushbutton. The PROG alarm lamp shall light.

6.2.11.10 From the uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the Shaft CDU register (address 36) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) and the PROG alarm discrete for the period during which the OPTICS CONTROL STICK was being displaced above. The Shaft CDU angle shall be 225.00±10.00 degrees at the time the PROG alarm occurred. The elapsed time from time of OPTICS CONTROL STICK displacement to the time the PROG alarm discrete is obtained shall be 19 to 32 seconds.

6.2.11.11 Set the OPTICS COUPLING switch to DIRECT. Again using the OPTICS CONTROL STICK, drive the optics until R1 = +225.00 and R2 = +10.000. Set the OPTICS COUPLING switch to RSLV.

6.2.11.12 While sighting on the optical target through the SCT eyepiece, displace the OPTICS CONTROL STICK fully to the right. Verify that the target image appears to move in a straight line horizontally to the right and release the OPTICS CONTROL STICK when the target image reaches the edge of the SCT field of view.

6.2.11.13 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS COUPLING switch on the G&N Panel to DIRECT. Set the OPTICS ZERO switch to ZERO.

6.2.12 Optics Functional Test

6.2.12.1 Set/verify the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify the following:

a. +28 VDC OPTX OPERATE BUS (CG 1530) is 28.8±3 VDC. Record the indication on the CRT.

b. CG 1211 OPTX 28V 800 cps 1% 0 ph not flashing on CRT.

c. CG 1212 OPTX 800 cps 5% -90 ph not flashing on CRT.

6.2.12.2 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Insure that the Optics control switches on the G&N Indicator Control Panel are set as follows:

a. OPTICS ZERO to ZERO
b. OPTICS MODE to MAN
c. OPTICS SPEED to LO
d. OPTICS COUPLING to DIRECT
e. OPTICS TRUN to SLAVE to SXT

6.2.12.3 Set OPTICS ZERO switch to OFF.

6.2.12.4 Resolution checks

6.2.12.4.1 SXT Resolution Check - MSO only

6.2.12.4.1.1 Sight through the SXT eyepiece. Using the OPTICS CONTROL STICK adjust the SXT to obtain the best reflected field of view of the 5-inch autocollimator reticle engravings at the center of view.

6.2.12.4.1.2 Note that the autocollimator reticle contains a series of lines of different thickness and width. Each set of lines is marked with a number (20, 15, 10, 7, 5, 3) which indicates the angle subtended by one line and one space. View each set of lines to determine the lowest numbered set in which resolution between lines (ability to distinguish separate distinct lines within a set) can be made. Record the number associated with that set of lines. The SXT resolution shall be at least 10 arc seconds at the center of the field of view.

6.2.12.4.2 SCT Resolution Check

6.2.12.4.2.1 Sight through the SCT EYEPIECE. Using the OPTICS CONTROL STICK adjust the SCT to obtain the best view of the SCT RESOLUTION CHART held in the Optics line of sight.

6.2.12.4.2.2 Note the chart contains sets of lines. View each set of lines to determine the lowest numbered set in which the resolution between lines (ability to distinguish separate lines within a set) can be made. The SCT shall have a resolution of at least 3 arc minutes at the center of the field of view.

6.2.12.5 Slave Telescope Mode Checks

6.2.12.5.1 Verify/perform OPTICS POWER ON TEST per paragraph 6.2.3.2.

6.2.12.5.2 Set/verify following switches on G&N INDICATOR CONTROL PANEL:

a. OPTICS TEL TRUN - SLAVE to SXT
b. OPTICS COUPLING - DIRECT
c. OPTICS SPEED - HI

6.2.12.5.3 Monitor OCDU's by entering VERB 16 NOUN 91, ENTER into K-148.

6.2.12.5.4 Set OPTICS MODE to MAN.

6.2.12.5.5 Using the Optics Hand Controller drive the optics until:

R1 = +000.00±001.00 (SHAFT)
R2 = +10.000±01.000 (TRUNNION)

6.2.12.5.6 Verify on the CRT and Optics Panel:

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = R2 ±0.22 DEG

6.2.12.5.7 Set the OPTICS TEL TRUN on the G&N INDICATOR CONTROL PANEL to 0°.

6.2.12.5.8 Verify:

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = 0.0° ±0.22 DEG

R2 approximately equal to value specified in step 6.2.12.5.5.

6.2.12.5.9 Set the OPTICS TEL TRUN on the G&N INDICATOR CONTROL PANEL to OFFSET 25°.

6.2.12.5.10 Verify on CRT and Optics Panel:

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = 25° ±1.00 DEG
R2 approximately equal to value specified in step 6.2.12.5.5.

6.2.12.5.11 On the G&N INDICATOR CONTROL PANEL set the OPTICS TEL TRUN to SLAVE to SXT.

6.2.12.5.12 Verify on CRT and Optics Panel:

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = R2 ±0.22 DEG

6.2.12.5.13 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). On the G&N INDICATOR CONTROL PANEL set the OPTICS ZERO to ZERO. Wait 15 sec.

6.2.12.5.14 Verify on CRT and OPTICS PANEL.

R1 = 000.00 +000.02, -000.03
R2 = 00.000 +00.006, -00.007

SHAFT TPAC = R1 ±0.11 DEG
TRUN TPAC = R2 ±0.22 DEG

6.2.12.5.15 If Optics testing will not be continued, set the G&N POWER-OPTICS switch on the LEB Lighting Control Panel to OFF.

6.2.12.6 SXT Parallelism Tests

6.2.12.6.1 Remove the plug from the base of the SXT eyepiece and install the Adapter Assembly and Portable Light Assembly. Turn on the light.

NOTE: If needed to reduce external light, place a photographers hood over the optics head.

6.2.12.6.2 SXT Auto Collimator Parallelism Test - MSO only.

6.2.12.6.2.1 Using the OPTICS CONTROL STICK drive the SXT StLOS Trunnion to +15.00° ±2° as indicated in R2 of the DSKY. Maintain a Shaft CDU angle of 000.00±0.10 degrees.

6.2.12.6.2.2 Sight through the 5-inch autocollimator eyepiece and adjust the measurement knob to superimpose the SXT LLOS horizontal reticle image upon the autocollimator horizontal filar. Record the autocollimator reading.

6.2.12.6.2.3 Repeat 6.2.12.6.2.2 twice. Calculate and record the average of the three autocollimator readings.

6.2.12.6.2.4 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT), Set the OPTICS ZERO switch to ZERO.

6.2.12.6.2.5 Again sight through the 5-inch autocollimator eyepiece and adjust the measurement knob to bring the SXT StLOS horizontal reticle and autocollimator horizontal filar images to coincide. Record the autocollimator reading.

6.2.12.6.2.6 Repeat 6.2.12.6.2.5 twice. Calculate and record the average of the three autocollimator readings. The average value obtained here shall not differ from that obtained in 6.2.12.1 by more than 10 arc seconds.

6.2.12.7 SXT, CMC Functional Check

6.2.12.7.1 Set the OPTICS MODE switch to MAN. Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT).

Set the OPTICS ZERO switch to ZERO. After 15 seconds, return the switch to OFF.

6.2.12.7.2 Sight through the SXT. Using the Control Stick align the SXT StLOS with Optical Target No. 1.

6.2.12.7.3 When aligned, record the value of the Shaft and Trunnion CDU's from the CRT.

6.2.12.7.4 Sight through the SXT. Using the Control Stick align the SXT StLOS with Optical Target No. 2.

6.2.12.7.5 When aligned, record the value of the Shaft and Trunnion CDU's from the CRT.

6.2.12.7.6 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Indicator Control Panel to ZERO. After 15 seconds set the OPTICS ZERO switch to OFF. Set the OPTICS MODE switch to CMC.

6.2.12.7.7 Enter VERB 41, NOUN 91, ENTER into the DSKY. Enter the value for Shaft from 6.2.12.7.3 into the DSKY and press ENTER. Enter the value for Trunnion from 6.2.12.7.3 into the DSKY and press ENTER.

6.2.12.7.8 Sight through the SXT. The StLOS should be approximately centered on the Optical Target No. 1. Record the value of Shaft and Trunnion CDU's from the CRT. The difference between these values and the corresponding values recorded in 6.2.12.7.3 shall be less than 0.06 degrees for the Shaft and 0.02 degrees for the Trunnion. Record the difference.

6.2.12.7.9 Enter VERB 41, NOUN 91, ENTER into the DSKY. Enter the value for Shaft from 6.2.12.7.5 into the DSKY and press the ENTER pushbutton. Enter the value for Trunnion from 6.2.12.7.5 into the DSKY and press the ENTER pushbutton.

6.2.12.7.10 Sight through the SXT. The StLOS should be approximately centered on the Optical Target No. 2. Record the value of Shaft and Trunnion CDU's from the CRT. The difference between these values and the corresponding values recorded in 6.2.12.7.5 shall be less than 0.06 degrees for the Shaft and 0.02 degrees for the Trunnion. Record the difference.

6.2.12.7.11 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds.

6.2.12.7.12 If OPTICS testing will not continue, set the G&N Power Optics switch on the LEB Lighting Panel to OFF.

6.2.13 Optics Slew Rate Test

6.2.13.1 Set/Verify the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify the following signals on the CRT.

a. +28 VDC OPTICS OPERATE BUS (CG 1530) is +29.0±3.0 VDC.
b. OPTX 28V 800 cps 1% 0° ph not flashing on the CRT.
c. OPTX 28V 800 cps 5% -90° ph not flashing on the CRT.

6.2.13.1.1 Verify and/or set the following switches on the G&N Indicator Control Panel to the positions indicated:

a. OPTICS TEL TRUN to SLAVE to SXT
b. OPTICS COUPLING to DIRECT
c. OPTICS SPEED to HI
d. OPTICS MODE to MAN.

6.2.13.2 Monitor the OCDU's by entering VERB 16 NOUN 91, ENTER into K148. Insure RECORD DSKY and RECORD DOWNLINK on R-145 are ON.

6.2.13.3 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch on the G&N Indicator Control Panel to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch on the G&N Indicator Panel to OFF. Set the OPTICS MODE switch to MAN.
TRUNNION SLEW RATE - HI SPEED

6.2.13.4 NOTE: Read and understand the entire step before proceeding. Do not hold Control Stick at upper limit more than 10 seconds or exceed a trunnion angle of 85°.

TRUNNION SLEW RATE - HI SPEED

Record time. Push and hold the Optics Control Stick to its upper limit. After approximately 7 seconds release the control stick. Record the SXT Trunnion Servo Error In-Phase output (CG 3118) and SXT Trun Tach (CG 3150) signals on the CRT while slewing the optics. The CG 3118 shall be -0.25 to -2.00 VRMS. CG 3150 shall be 3.3±1.3 VRMS.

6.2.13.5 Perform the following calculations:
From the Uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the trunnion CDU register (address 35) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 7 second period during which the rate test was being performed.

Calculate the slew rate by dividing the ΔCDU angle by the elapsed time.

The Trunnion slew rate shall be 10.0±2.0 deg/sec.

SHAFT SLEW RATE - HI SPEED

6.2.13.6 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF.

6.2.13.7 NOTE: Read and understand the entire step before proceeding. Do not hold Control Stick at right limit for more than 10 seconds or exceed a shaft angle of 250°.

Record time. Push and hold the Optics Control stick to its right limit. After approximately 7 seconds release the control stick.

Record the SXT Shaft Servo Error In-Phase Output (CG 3117) and SXT Shaft Tach (CG 3140) signals on the CRT while slewing the optics. CG 3117 shall be -0.25 to -2.00 VRMS. CG 3140 shall be 3.3±1.3 VRMS.

6.2.13.8 Perform the following calculations:

From the uplink file tape, the compressed data tape or the PCM tape, request a data reduction of the Shaft CDU register (address 36) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 7 second period during which the rate test was being performed.

Calculate the rate by dividing the ΔCDU angle by the elapsed time.

The Shaft slew rate shall be 19.5±3.9 deg/sec.

TRUNNION SLEW RATE - MED SPEED

6.2.13.9 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF. Set the OPTICS SPEED switch to MED.

6.2.13.10 NOTE: Read and understand the entire step before proceeding. Do not hold control stick at upper limit for more than 20 seconds.

Record time. Push and hold the Optics Control Stick to its upper limit. After approximately 12 seconds release the control stick. Record the SXT TRUN MTR Control Winding (CG 3155) signal while slewing the optics. CG 3155 shall be +0.25 to +2.00 VRMS.

6.2.13.11 Perform the following calculations:

From the uplink file tape,the compressed data tape,or the PCM tape request a data reduction of the Trunnion CDU registers (address 35) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 12 second period during which the rate test was being performed.

Calculate the rate by dividing the ΔCDU angle by the elapsed time.

The trunnion slew rate shall be 1.0±0.2 deg/sec.

SHAFT SLEW RATE - MED SPEED

6.2.13.12 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF.

6.2.13.13 NOTE: Read and understand the entire step before proceeding. Do not hold control stick at right limit for more than 20 seconds.

Record time. Push and hold the Optics Control Stick to its right limit. After approximately 12 seconds release the control stick. Record the SXT Shaft MTR Control Winding (CG 3145) signal while slewing the optics. CG 3145 shall be +0.50 to +4.00 VRMS.

6.2.13.14 Perform the following calculations:

From the uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the CDU register (address 36) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 12 second period during which the rate test was being performed.

Calculate the rate by dividing the ΔCDU angle by the elapsed time.

The Shaft slew rate shall be 2.0±0.4 deg/sec.

TRUNNION SLEW RATE - LO SPEED

6.2.13.15 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF. Set the OPTICS SPEED switch to LO.

6.2.13.16 NOTE: Read and understand the entire step before proceeding. Do not hold control stick at upper limit for more than 30 seconds.

Record time. Push and hold the Optics Control Stick to its upper limit. After approximately 12 seconds release the control stick.

6.2.13.17 Perform the following calculations:

From the uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the Trunnion CDU register (address 35) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 12 second period during which the rate test was being performed.

Calculate the rate by dividing the ΔCDU angle by the elapsed time.

The Trunnion slew rate shall be 0.10±0.02 deg/sec.

SHAFT SLEW RATE - LO SPEED

6.2.13.18 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF.

6.2.13.19 NOTE: Read and understand the entire step before proceeding. Do not hold control stick at right limit for more than 20 seconds.

Record time. Push and hold the Optics Control Stick to its right limit. After approximately 12 seconds release the control stick.

6.2.13.20 Perform the following calculations:

From the uplink file tape, the compressed data tape, or the PCM tape request data reduction of the CDU register (address 36) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 12 second period during which the rate test was being performed.

Calculate the rate by dividing the ΔCDU angle by the elapsed time.

The Shaft slew rate shall be 0.20±0.04 deg/sec.

OPTICS HAND CONTROLLER DRIFT RATE CHECK - LO SPEED

6.2.13.21 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT.) Set the OPTICS ZERO switch to ZERO. Wait 15 seconds. Set the OPTICS ZERO switch to OFF. Record time. Wait 60 seconds.

6.2.13.22 **Perform the following calculations:**

From the uplink file tape, the compressed data tape, or the PCM tape request a data reduction of the Trunnion and Shaft CDU registers (addresses 35 and 36 respectively) and the TIME 2 and TIME 1 registers (addresses 24 and 25 respectively) for the 60 second period during which the drift rate test was being performed.

Calculate the drift rate by dividing the ΔCDU angles by the elapsed time.

The Trunnion drift rate shall be less than .0167 deg/sec.

The Shaft drift rate shall be less than .0333 deg/sec.

6.2.13.23 If OPTICS testing will not continue; set the G/N Power-Optics switch on the LEB Lighting Control Panel to OFF.

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6.2.14 Stabilization Loop Step Response Test

6.2.14.1 Proceed with this test if the Operate Power On Test of 6.2.3 has been performed and system operation has not been interrupted. If system operation has been interrupted, perform the Turn On Procedure of 6.2.5.2 before proceeding.

6.2.14.2 Insure that the Carry-on Command Stimuli Unit, Model No. C14-200, is installed and connected.

6.2.14.3 Enter VERB 36 into K148. Press the ENTER pushbutton, then the ERROR RESET pushbutton.

6.2.14.4 Inner Gimbal Response Test.

6.2.14.4.1 Enter code 2032000000 in C-START Module. Press the XEQ/SEAL pushbutton to call up CG 2117 IGA SERVO ERROR.

6.2.14.4.2 Enter the following into K148:

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.14.4.3 Wait 15 seconds.

6.2.14.4.4 Enter VERB 40 NOUN 20, ENTER into K148. Wait 15 seconds.

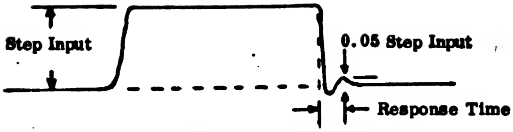
6.2.14.4.5 Enter 0001 into R154. Verify and execute to apply +28 VDC ACE ENABLE to the PSAAM.

6.2.14.4.6 Enter 1000 into R155. Verify and execute to enter a DC step into the IG stabilization loop.

CAUTION: If the transient caused by the step input does not settle within 15 seconds, remove the IMU OPERATE power by setting the G/N POWER IMU switch on the LEB Lighting Control Panel to OFF.

6.2.14.4.7 Enter 0000 into R155; the top part of switch should be extinguished. Insure that no other function switches on R155 are illuminated. Start analog recorder. Press the XEQ/SEAL pushbutton to remove the step input to the IG Stabilization Loop. The bottom part of switch shall be extinguished.

6.2.14.4.8 After the transient has settled, stop the analog recorder. Record the loop response time by measuring the time interval between removing the step (initial disturbance) and the settling of the error signal to a value equal to ±5% of the original step amplitude. In addition, record the total number of overshoots. See Figure 2 for typical step input response.



TYPICAL STEP INPUT RESPONSE

FIGURE 2

6.2.14.4.8.1 The inner gimbal stabilization loop response time shall be less than 0.1 second.

6.2.14.4.8.2 The maximum number of overshoots on the IGA Servo Error Signals shall be three.

6.2.14.5 Middle Gimbal Response Test.

6.2.14.5.1 Enter code 2028000000 into C-START MODULE. Press the XEQ/SEAL pushbutton to call up CG 2147 MGA SERVO ERROR.

6.2.14.5.2 Enter the following into K148:

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.14.5.3 Wait 15 seconds.

6.2.14.5.4 Enter VERB 40 NOUN 20 ENTER into K148. Wait 15 seconds.

6.2.14.5.5 Enter 0100 into R155. The top part of switch shall be illuminated. Insure that no other function switches on R155 are illuminated.

6.2.14.5.6 Press XEQ/SEAL pushbutton on R155 to enter a DC step into the MG Stabilization Loop.

CAUTION: If the transient caused by the step input does not settle within 15 seconds, remove the IMU OPERATE power by setting the C/N POWER IMU switch on the LEB Lighting Control Panel to OFF.

6.2.14.5.7 Enter 0000 into R155. The top part of the switch shall be extinguished. Insure that no other function switches on R155 are illuminated. Start analog recorder. Press XEQ/SEAL pushbutton to remove the step inputs to the MG stabilization loop.

6.2.14.5.8 After the transients have settled, stop the analog recorder. Record the loop response time by measuring the time interval between removing the step (initial disturbance) and the settling of the error signal to a value equal to ±5% of the original step amplitude. In addition, record the total number of overshoots.

6.2.14.5.8.1 The middle gimbal stabilization loop response time shall be less than 0.1 second.

6.2.14.5.8.2 The maximum number of overshoots on the MGA Servo Error signals shall be three.

6.2.14.6 Outer Gimbal Response Test.

6.2.14.6.1 Enter code 2026000000 in C-START Module. Press XEQ/SEAL Pushbutton to call up CG 2177 OGA SERVO ERROR.

6.2.14.6.2 Enter the following into K148:

VERB 41 NOUN 20	ENTER
+00000	ENTER
+00000	ENTER
+00000	ENTER

6.2.14.6.3 Wait 15 seconds.

6.2.14.6.4 Enter VERB 40 NOUN 20, ENTER into K148. Wait 15 seconds.

6.2.14.6.5 Enter 0010 into R155. The top half of the switch shall be illuminated. Insure that no other function switches on R155 are illuminated.

6.2.14.6.6 Press XEQ/SEAL pushbutton on R155 to enter a DC step into the OG Stabilization Loops.

NOTE: If the transient caused by the step input does not settle within 15 seconds, remove the IMU OPERATE power by setting the G/N POWER IMU switch on the LEB Lighting Control Panel to OFF.

6.2.14.6.7 Enter 0000 into R155. The top half of the switch shall be extinguished. Insure that no other function switches on R155 are illuminated. Start analog recorder. Press the XEQ/SEAL pushbutton to remove the step input to the OG Stabilization Loop.

6.2.14.6.8 After the transients have settled out, stop the analog recorder. Record the loop response time by measuring the time interval between removing the step (initial disturbance) and the settling of the error signal to a value equal to ±5% of the original step amplitude. In addition, record the total number of overshoots.

6.2.14.6.8.1 **The outer gimbal stabilization loop response time shall be less than 0.1 second.**

6.2.14.6.8.2 **The maximum number of overshoots on the OGA Servo Error Signals shall be five.**

6.2.14.7 **Enter VERB 40 NOUN 20 into K148. Press the ENTER pushbutton. Wait 15 seconds.**

6.2.14.7.1 **Enter the following into K148:**

VERB 41 NOUN 20 ENTER
+00000 ENTER
+00000 ENTER
+00000 ENTER

6.2.14.7.2 **Enter 0000 into R154. Verify and execute to remove +28 VDC ACE ENABLE.**

6.2.15 IRIG Scale Factor Test

6.2.15.1 Verify K-START Tape F09C103-K00083-XX IRIG Scale Factor Test is on the K-START tape reader. XX equals tape revision number.

6.2.15.2 Start tape reader.

6.2.15.2.1 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +09XXX
b. R2 = +00083
c. R3 = -000XX XX is tape revision number

6.2.15.2.2 Start tape reader.

6.2.15.2.3 When tape reader stops, wait 20 seconds.

6.2.15.3 E-Memory Program Load.

6.2.15.3.1 Start tape reader.

6.2.15.3.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00000.

6.2.15.4 Test Position Data Load (+X Scale Factor)

6.2.15.4.1 Start tape reader.

6.2.15.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.2.15.4.3 Start tape reader

6.2.15.4.4 When tape reader stops, VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nave Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.4.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.4.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001).

6.2.15.5 Test Position Data Load (+Y Scale Factor)

6.2.15.5.1 Start tape reader.

6.2.15.5.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.2.15.5.3 Start tape reader.

6.2.15.5.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.5.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.5.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.2.15.6 Test Position Data Load (+Z Scale Factor).

6.2.15.6.1 Start tape reader.

6.2.15.6.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.2.15.6.3 Start tape reader.

6.2.15.6.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.6.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.6.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.2.15.7 Test Position Data Load (-X Scale Factor)

6.2.15.7.1 Start tape reader.

6.2.15.7.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.2.15.7.3 Start tape reader.

6.2.15.7.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.7.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.7.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.2.15.8 Test Position Data Load (-Y Scale Factor)

6.2.15.8.1 Start tape reader.

6.2.15.8.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.2.15.8.3 Start tape reader.

6.2.15.8.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTER into K-148 and enter correct azimuth.

6.2.15.8.4 (continued) If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.8.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.8.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.2.15.9 Test Position Data Load (-Z Scale Factor)

6.2.15.9.1 Start tape reader.

6.2.15.9.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.2.15.9.3 Start tape reader.

6.2.15.9.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.9.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.9.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.2.15.10 Test Position Data Load (+X Scale Factor)

6.2.15.10.1 Start tape reader.

6.2.15.10.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.2.15.10.3 Start tape reader.

6.2.15.10.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.10.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.10.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.2.15.11 Test Position Data Load (+Y Scale Factor)

6.2.15.11.1 Start tape reader.

6.2.15.11.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.2.15.11.3 Start tape reader.

6.2.15.11.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.11.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.11.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.2.15.12 Test Position Data Load (+Z Scale Factor)

6.2.15.12.1 Start tape reader.

6.2.15.12.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.2.15.12.3 Start tape reader.

6.2.15.12.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX. XX Nav Base Azimuth
R2 = XX. XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.12.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.12.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.2.15.13 Test Position Data Load (-X Scale Factor)

6.2.15.13.1 Start tape reader.

6.2.15.13.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.2.15.13.3 Start tape reader.

6.2.15.13.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX. XX Nav Base Azimuth
R2 = XX. XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.13.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.13.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.2.15.14 Test Position Data Load (-Y Scale Factor)

6.2.15.14.1 Start tape reader.

6.2.15.14.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.2.15.14.3 Start tape reader.

6.2.15.14.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.14.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.14.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.2.15.15 Test Position Data Load (-Z Scale Factor)

6.2.15.15.1 Start tape reader.

6.2.15.15.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.2.15.15.3 Start tape reader.

6.2.15.15.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

6.2.15.15.4 (continued) If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.15.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.15.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.2.15.16 Test Position Data Load (+X Scale Factor)

6.2.15.16.1 Start tape reader.

6.2.15.16.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00001,

6.2.15.16.3 Start tape reader.

6.2.15.16.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.16.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.16.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.2.15.17 Test Position Data Load (+Y Scale Factor)

6.2.15.17.1 Start tape reader.

6.2.15.17.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.2.15.17.3 Start tape reader.

6.2.15.17.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.17.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.17.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.2.15.18 Test Position Data Load (+Z Scale Factor)

6.2.15.18.1 Start tape reader.

6.2.15.18.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.2.15.18.3 Start tape reader.

6.2.15.18.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.18.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.18.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.2.15.19 Test Position Data Load (-X Scale Factor)

6.2.15.19.1 Start tape reader.

6.2.15.19.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.2.15.19.3 Start tape reader.

6.2.15.19.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.19.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.19.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.2.15.20 Test Position Data Load (-Y Scale Factor)

6.2.15.20.1 Start tape reader.

6.2.15.20.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.2.15.20.3 Start tape reader.

6.2.15.20.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.20.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.20.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.2.15.21 Test Position Data Load (-Z Scale Factor)

6.2.15.21.1 Start tape reader.

6.2.15.21.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.2.15.21.3 Start tape reader.

6.2.15.21.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.21.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.21.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.2.15.22 Test Position Data Load (+X Scale Factor)

6.2.15.22.1 Start tape reader.

6.2.15.22.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00001.

6.2.15.22.3 Start tape reader.

6.2.15.22.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

6.2.15.22.4 (continued) If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.22.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.22.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.2.15.23 Test Position Data Load (+Y Scale Factor)

6.2.15.23.1 Start tape reader.

6.2.15.23.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.2.15.23.3 Start tape reader.

6.2.15.23.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.23.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.23.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.2.15.24 Test Position Data Load (+Z Scale Factor)

6.2.15.24.1 Start tape reader.

6.2.15.24.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.2.15.24.3 Start tape reader.

6.2.15.24.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.24.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.24.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.2.15.25 Test Position Data Load (-X Scale Factor)

6.2.15.25.1 Start tape reader.

6.2.15.25.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.2.15.25.3 Start tape reader.

6.2.15.25.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.25.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.25.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.2.15.26 Test Position Data Load (-Y Scale Factor)

6.2.15.26.1 Start tape reader.

6.2.15.26.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.2.15.26.3 Start tape reader.

6.2.15.26.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.26.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.26.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.2.15.27 Test Position Data Load (-Z Scale Factor)

6.2.15.27.1 Start tape reader.

6.2.15.27.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.2.15.27.3 Start tape reader.

6.2.15.27.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.2.15.27.5 On K-148 enter the following:

VERB 33 ENTR

6.2.15.27.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.2.15.28 Terminate this test by entering the following into K-148:

VERB 36	ENTR	Wait 10 seconds.
VERB 41 NOUN 20	ENTR	
+00000	ENTR	
+00000	ENTR	
+00000	ENTR	

6.2.15.29 The four-run average Scale Factor Error for each of the six positions shall be 0 plus or minus 1750 ppm.

6.2.16 IMU Performance Test. A reference data sheet is provided at the end of this section to aid in data reduction.

6.2.16.1 Insure that IMU Operate power and LGC Operate power has been supplied for a minimum of one hour and that the IMU is not in a Gimbal Lock condition.

6.2.16.2 On CRT, monitor and record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.2.16.3 Verify K-START Tape F09C103-K00081-XX IMU Performance test is on the tape reader. XX equals tape revision number

6.2.16.4 Start tape reader.

6.2.16.4.1 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +09XXX
b. R2 = +00081
c. R3 = -000XX (Where XX equals tape revision number.)

6.2.16.4.2 Start tape reader.

6.2.16.4.3 When tape reader stops, wait 10 seconds.

6.2.16.5 Start the tape reader. After 15 seconds, verify IMU is coarse aligned to zero degrees.

6.2.16.6 E-Memory Program Load.

6.2.16.6.1 Start the tape reader. When tape reader stops, verify the following DSKY display:

Row 1
Row 3

6.2.16.7 Test Position +00001.

6.2.16.7.1 E-Memory Program and Test Position Matrix Sum Check

6.2.16.7.1.1 Start tape reader.

6.2.16.7.1.2 When tape reader stops, verify DSKY Row 1 displays +00001.

6.2.16.7.2 Start tape reader.

6.2.16.7.2.1 When tape reader stops wait 20 seconds.

6.2.16.7.3 Test Initialization.

6.2.16.7.3.1 Start tape reader.

6.2.16.7.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.7.4 Horizontal Drift Test

6.2.16.7.4.1 Start tape reader.

6.2.16.7.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.7.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.7.5 Test Termination.

6.2.16.7.5.1 Start tape reader.

6.2.16.7.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.8 Test Position +00002.

6.2.16.8.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.8.1.1 Start tape reader.

6.2.16.8.1.2 When tape reader stops, verify DSKY Row 1 displays +00002.

6.2.16.8.2 Start tape reader.

6.2.16.8.2.1 When tape reader stops, wait 20 seconds.

6.2.16.8.3 Test Initialization.

6.2.16.8.3.1 Start tape reader.

6.2.16.8.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.8.4 Horizontal Drift Test.

6.2.16.8.4.1 Start tape reader.

6.2.16.8.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.8.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.8.5 PIPA Scale Factor Test.

6.2.16.8.5.1 Start tape reader.

6.2.16.8.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.2.16.8.6 Vertical Drift Test.

6.2.16.8.6.1 Start tape reader.

6.2.16.8.6.2 In approximately 67 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.2.16.8.7 Test Termination.

6.2.16.8.7.1 Start tape reader.

6.2.16.8.7.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.9 Test Position +00003.

6.2.16.9.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.9.1.1 Start tape reader.

6.2.16.9.1.2 When tape reader stops, verify DSKY Row 1 displays +00003.

6.2.16.9.2 Start tape reader.

6.2.16.9.2.1 When tape reader stops, wait 20 seconds.

6.2.16.9.3 Test Initialization.

6.2.16.9.3.1 Start tape reader.

6.2.16.9.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.9.4 Horizontal Drift Test

6.2.16.9.4.1 Start tape reader.

6.2.16.9.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.9.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.9.5 Test Termination.

6.2.16.9.5.1 Start tape reader.

6.2.16.9.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.10 Test Position +00004.

6.2.16.10.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.10.1.1 Start tape reader.

6.2.16.10.1.2 When tape reader stops, verify DSKY Row 1 displays +00004.

6.2.16.10.2 Start tape reader.

6.2.16.10.2.1 When tape reader stops, wait 20 seconds.

6.2.16.10.3 Test Initialization.

6.2.16.10.3.1 Start tape reader.

6.2.16.10.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.10.4 Horizontal Drift Test.

6.2.16.10.4.1 Start tape reader.

6.2.16.10.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.10.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.2.16.10.5 PIPA Scale Factor Test.

6.2.16.10.5.1 Start tape reader.

6.2.16.10.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.2.16.10.6 Vertical Drift Test.

6.2.16.10.6.1 Start tape reader.

6.2.16.10.6.2 In approximately 67 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.2.16.10.7 Test Termination.

6.2.16.10.7.1 Start tape reader.

6.2.16.10.7.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.11 Test Position +00005.

6.2.16.11.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.11.1.1 Start tape reader.

6.2.16.11.1.2 When tape reader stops, verify DSKY Row 1 displays +00005.

6.2.16.11.2 Start tape reader.

6.2.16.11.2.1 When tape reader stops, wait 20 seconds.

6.2.16.11.3 Test Initialization.

6.2.16.11.3.1 Start tape reader.

6.2.16.11.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.11.4 **PIPA Scale Factor Test**

6.2.16.11.4.1 Start tape reader. Record time.

6.2.16.11.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM and GIMBAL LOCK lamps shall be lit.

6.2.16.11.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.2.16.11.5 Test Termination.

6.2.16.11.5.1 Start tape reader.

6.2.16.11.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.12 Test Position +00006.

6.2.16.12.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.12.1.1 Start tape reader.

6.2.16.12.1.2 When tape reader stops, verify DSKY Row 1 displays +00006.

6.2.16.12.2 Start tape reader.

6.2.16.12.2.1 When tape reader stops, wait 20 seconds.

6.2.16.12.3 Test Initialization.

6.2.16.12.3.1 Start tape reader.

6.2.16.12.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.12.4 PIPA Scale Factor Test.

6.2.16.12.4.1 Start tape reader. Record time.

6.2.16.12.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM and GIMBAL LOCK lamps shall be lit.

6.2.16.12.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.2.16.12.5 Test Termination.

6.2.16.12.5.1 Start tape reader.

6.2.16.12.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.13 Test Position +00007.

6.2.16.13.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.13.1.1 Start tape reader.

6.2.16.13.1.2 When tape reader stops verify DSKY Row 1 displays +00007.

6.2.16.13.2 Start tape reader.

6.2.16.13.2.1 When tape reader stops, wait 20 seconds.

6.2.16.13.3 Test Initialization.

6.2.16.13.3.1 Start tape reader.

6.2.16.13.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.13.4 Horizontal Drift Test.

6.2.16.13.4.1 Start tape reader.

6.2.16.13.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.13.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.2.16.13.5 Test Termination.

6.2.16.13.5.1 Start tape reader.

6.2.16.13.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.14 Test Position +00008.

6.2.16.14.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.14.1.1 Start tape reader.

6.2.16.14.1.2 When tape reader stops, verify DSKY Row 1 displays +00008.

6.2.16.14.2 Start tape reader.

6.2.16.14.2.1 When tape reader stops, wait 20 seconds.

6.2.16.14.3 Test Initialization.

6.2.16.14.3.1 Start tape reader.

6.2.16.14.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.14.4 Horizontal Drift Test

6.2.16.14.4.1 Start tape reader.

6.2.16.14.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish

6.2.16.14.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.14.5 Test Termination.

6.2.16.14.5.1 Start tape reader.

6.2.16.14.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.15. Test Position +00009.

6.2.16.15.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.15.1.1 Start tape reader.

6.2.16.15.1.2 When tape reader stops, verify DSKY Row 1 displays +00009.

6.2.16.15.2 Start tape reader.

6.2.16.15.2.1 When tape reader stops, wait 20 seconds.

6.2.16.15.3 Test Initialization.

6.2.16.15.3.1 Start tape reader.

6.2.16.15.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.15.4 Horizontal Drift Test.

6.2.16.15.4.1 Start tape reader.

6.2.16.15.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.15.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.15.5 Test Termination

6.2.16.15.5.1 Start tape reader.

6.2.16.15.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.16 Test Position +00010.

6.2.16.16.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.16.1.1 Start tape reader.

6.2.16.16.1.2 When tape reader stops, verify DSKY Row 1 displays +00010.

6.2.16.16.2 Start tape reader.

6.2.16.16.2.1 When tape reader stops, wait 20 seconds.

6.2.16.16.3 Test Initialization.

6.2.16.16.3.1 Start tape reader.

6.2.16.16.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.16.4 Horizontal Drift Test.

6.2.16.16.4.1 Start tape reader.

6.2.16.16.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.16.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.16.5 Test Termination.

6.2.16.16.5.1 Start tape reader.

6.2.16.16.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.17 Test Position +00011.

6.2.16.17.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.17.1.1 Start tape reader.

6.2.16.17.1.2 When tape reader stops, verify DSKY Row 1 displays +00011.

6.2.16.17.2 Start tape reader.

6.2.16.17.2.1 When tape reader stops, wait 20 seconds.

6.2.16.17.3 Test Initialization.

6.2.16.17.3.1 Start tape reader.

6.2.16.17.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.17.4 Horizontal Drift Test.

6.2.16.17.4.1 Start tape reader.

6.2.16.17.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.17.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.17.5 PIPA Scale Factor Test.

6.2.16.17.5.1 Start tape reader.

6.2.16.17.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.2.16.17.6 Test Termination.

6.2.16.17.6.1 Start tape reader.

6.2.16.17.6.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.18 Test Position +00012.

6.2.16.18.1 E-Memory Program and Test Position Matrix Sum Check

6.2.16.18.1.1 Start tape reader.

6.2.16.18.1.2 When tape reader stops, verify DSKY Row 1 displays +00012.

6.2.16.18.2 Start tape reader.

6.2.16.18.2.1 When tape reader stops, wait 20 seconds.

6.2.16.18.3 Test Initialization.

6.2.16.18.3.1 Start tape reader.

6.2.16.18.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

6.2.16.18.3.2 (continued) If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.18.4 Horizontal Drift Test.

6.2.16.18.4.1 Start tape reader.

6.2.16.18.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.18.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.18.5 PIPA Scale Factor Test.

6.2.16.18.5.1 Start tape reader.

6.2.16.18.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXX. and .XXXXX cm/sec/sec).

6.2.16.18.6 Test Termination.

6.2.16.18.6.1 Start tape reader.

6.2.16.18.6.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.19 Test Position +00013.

6.2.16.19.1 E-Memory Program and Test Position Matrix Sum Check.

6.2.16.19.1.1 Start tape reader.

6.2.16.19.1.2 When tape reader stops, verify DSKY Row 1 displays +00013.

6.2.16.19.2 Start tape reader.

6.2.16.19.2.1 When tape reader stops, wait 20 seconds.

6.2.16.19.3 Test Initialization.

6.2.16.19.3.1 Start tape reader.

6.2.16.19.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.2.16.19.4 Horizontal Drift Test.

6.2.16.19.4.1 Start tape reader.

6.2.16.19.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.2.16.19.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.2.16.19.5 Test Termination.

6.2.16.19.5.1 Start tape reader.

6.2.16.19.5.2 When tape reader stops, wait 10 seconds before continuing.

6.2.16.20 On CRT, record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.2.16.21 On K-148, enter the following sequence:

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

6.2.16.22 Calculations.

NOTE: Use Post Vibration or System Test data points only.

6.2.16.22.1 Y PIPA Data Correction Calculation.

6.2.16.22.1.1 From the uplink file tape, the compressed data tape or the PCM tape, request a data reduction of the X and Z accelerometer ΔV counts (addresses 37 and 41, respectively) and the TIME 2 and TIME 1 registers (addresses 24 and 25, respectively) for the period during which the Y PIPA test was being performed in Positions 5 and 6 of the IMU Performance Test.

6.2.16.22.1.2 Perform the following calculations for Position 5.

$G'_5 = (G_5/\cos \theta y_5)$

where:

G_5 = Measured acceleration term (line 1)

G'_5 = Corrected acceleration term

$\cos \theta y_5 = 1 - (\theta^2 y_5/2)$ for small angles

$\theta y_5 = \sqrt{\theta^2{}_{x5} + \theta^2{}_{z5}}$

and:

$\theta_{z5} = (\Delta V_{x5} - \Delta V_x \text{ Bias}) (S.F._x)/(\Delta T) (\text{local } g)$

$\theta_{x5} = (\Delta V_{z5} - \Delta V_z \text{ Bias}) (S.F._z)/(\Delta T) (\text{local } g)$

and:

$V_x \text{ Bias} = (X \text{ PIPA Bias}) (\Delta T)/S.F._x$

$V_z \text{ Bias} = (Z \text{ PIPA Bias}) (\Delta T)/S.F._z$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.2.16.22.1.3 Perform the following calculations for Position 6.

$G'_6 = (G_6/\text{Cos }\theta y_6)$

where:

G_6 = Measured acceleration term (line j)

G'_6 = Corrected acceleration term

$\text{Cos }\theta y_6 = 1 - (\theta^2 y_6/2)$ for small angles

$\theta y_6 = \sqrt{\theta^2{}_{x6} + \theta^2{}_{z6}}$

and:

$\theta_{z6} = (\Delta V_{x6} - \Delta V_x \text{ Bias})\ (\text{S.F.}_x)\ /\ (\Delta T)\ (\text{local g})$

$\theta_{x6} = (\Delta V_{z6} - \Delta V_z \text{ Bias})\ (\text{S.F.}_z)\ /\ (\Delta T)\ (\text{local g})$

and:

V_x Bias = (X PIPA Bias) $(\Delta T)/\text{S.F.}_x$

V_z Bias = (Z PIPA Bias) $(\Delta T)/\text{S.F.}_z$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.2.16.22.2 Obtain data from last IRIG and/or PIPA Test and fill in Data Sheet x_{1-1}.

6.2.16.22.3 Obtain data from second last IRIG and/or PIPA Test and fill in Data Sheet x_{1-2}.

6.2.16.22.4 Obtain data from third last IRIG and/or PIPA Test and fill in Data Sheet x_{1-3}.

6.2.16.22.5 Perform the following calculations for each item appearing on Data Sheet x_i.

NOTE: See Paragraph 5.5 before continuing.

$$D_1 = \left| x_{i-1} - x_i \right|$$

$$D_2 = \left| x_{i-1} - x_i \right| + \left| x_{i-2} - x_{i-1} \right|$$

$$D_3 = \left| x_{i-3} - x_{i-2} \right| + \left| x_{i-2} - x_{i-1} \right| + \left| x_{i-1} - x_i \right|$$

DATA SHEET

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.2.16. 7.4.3	+N BDY - ADOAY Position +00001	meru/g	( ) ___ . __	a
6.2.16. 8.4.3	+N BDZ - ADOAZ Position +00002	meru/g	( ) ___ . __	b
6.2.16. 8.5.2	-X PIPA Test Position +00002	cm/sec^2	( ) 0 0 ___ . ( ) _____	c
6.2.16. 8.6.2	-N BDX + ADIAX Position +00002	meru/g	( ) ___ . __	d
6.2.16. 9.4.3	+N BDX - ADOAX Position +00003	meru/g	( ) ___ . __	e
6.2.16. 10.4.3	+N BDY + ADSRAY Position +00004	meru/g	( ) ___ . __	f
6.2.16. 10.5.2	-Z PIPA Test Position +00004	cm/sec^2	( ) 0 0 ___ . ( ) _____	g
6.2.16. 10.6.2	+N BDZ + ADIAZ Position +00004	meru/g	( ) ___ . __	h
6.2.16 11.4.3	+Y PIPA Test Position +00005	cm/sec^2	( ) 0 0 ___ . ( ) _____	i

DATA SHEET (continued)

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.2.16. 12.4.3	-Y PIPA Test Position +00006	cm/sec^2	( ) 0 0 ___ . ( ) _____	j
6.2.16 13.4.3	-NBDX + .707 (ADSRAX - ADOAX) Position +00007	meru/g	( ) ___ . __	k
6.2.16. 14.4.3	-.707 (NBDZ+NBDY) +0.5 (ADIAZ-ADIAY) +0.5 (ADSRAY + ADSRAZ) Position +00008	meru/g	( ) ___ . __	l
6.2.16. 15.4.3	-NBDZ + .707 (ADSRAZ-ADOAZ) Position +00009	meru/g	( ) ___ . __	m
6.2.16 16.4.3	.707 (NBDY-NBDX) +0.5 (ADIAY-ADIAX) +0.5 (ADSRAX) + 0.5 (ADOAY) Position +00010	meru/g	( ) ___ . __	n
6.2.16 17.4.3	-NDBX - ADOAX Position +00011	meru/g	( ) ___ . __	o
6.2.16. 17.5.2	+Z PIPA Test Position +00011	cm/sec^2	( ) 0 0 ___ . ( ) _____	p
6.2.16. 18.4.3	+NBDY + ADOAY Position +00012	meru/g	( ) ___ . __	q
6.2.16. 18.5.2	+X PIPA Test Position +00012	cm/sec^2	( ) 0 0 ___ . ( ) _____	r
6.2.16. 19.4.3	+NBDZ + ADOAZ Position +00013	meru/g	( ) ___ . __	s

DATA SHEET

CALCULATION	PARAMETER	UNITS	
$\frac{\text{line a + line q}}{2}$ = ( )___.__ $\frac{NBDY - ADOAY + NBDY + ADOAY}{2}$ Transfer result to line ao	NBDY	meru	t
$\frac{\text{line q - line a}}{2}$ = ( )___.__ $\frac{NBDY + ADOAY - (NBDY - ADOAY)}{2}$	ADOAY	meru/g	u
$\frac{\text{line b + line s}}{2}$ = ( )___.__ $\frac{NBDZ - ADOAZ + NBDZ + ADOAZ}{2}$ Transfer result to line ap	NBDZ	meru	v
$\frac{\text{line s - line b}}{2}$ = ( )___.__ $\frac{NBDZ + ADOAZ - (NBDZ - ADOAZ)}{2}$	ADOAZ	meru/g	w
$\frac{\text{line e - line o}}{2}$ = ( )___.__ $\frac{NBDX - ADOAX - (-NBDX - ADOAX)}{2}$ Transfer result to line aq	NBDX	meru	x
$\frac{\text{line e + line o}}{2}$ x (-1) = ( )___.__ $\frac{NBDX - ADOAX - NBDX - ADOAX}{2}$ x (-1)	ADOAX	meru/g	y

DATA SHEET (continued)

CALCULATION	PARAMETER	UNITS	
line d + line x = ( )___.__ (-NBDX + ADIAX) + NBDX Transfer result to line au	ADIAX	meru/g	z
line f - line t = ( )___.__ (+NBDY + ADSRAY) - NBDY Transfer result to line ar	ADSRAY	meru/g	aa
line h - line v = ( )___.__ (+NBDZ + ADIAZ) - NBDZ Transfer result to line av	ADIAZ	meru/g	ab
[line k + line x + .707 line y] x 1.414 [-NBDX + .707 ADSRAX -.707 ADOAX + NBDX + .707 ADOAX] x 1.414 Transfer results to line at	ADSRAX	meru/g	ac
(line m + line v + line w) x 1.414 [-NBDZ + .707(ADSRAZ-ADOAZ) + NBDZ + .707 ADOAZ] x 1.414 Transfer results to line as	ADSRAZ	meru/g	ad
(line n - .707 line t + .707 line x + 0.5 line z - 0.5 line ac - 0.5 line u) x 2 [.707(NBDY-NBDX) + 0.5(ADIAY-ADIAX) +0.5 ADSRAX + 0.5 ADOAY -.707 NBDY + .707 NBDX + 0.5 ADIAX -0.5 ADSRAX - 0.5 ADOAY] x 2 Transfer results to line aw.	ADIAY	meru/g	ae
line r - line c = ( )	PIPA X2G	cm/sec^2	af
line i - line j = ( )	PIPA Y2G	cm/sec^2	ag
line p - line g = ( )	PIPA Z2G	cm/sec^2	ah

DATA SHEET (continued)

CALCULATION	PARAMETER	UNITS	
1958.48 — line af x 1 cm/sec pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ax.	X PIPA S.F.	cm/sec/ pulse	ai
1958.48 — line ag x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ay.	Y PIPA S.F.	cm/sec/ pulse	aj
1958.48 — line ah x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer to line az.	Z PIPA S.F.	cm/sec pulse	ak
1/2 (line r + line c) = ( )__ . ___ Transfer results to line ba.	X PIPA Bias	cm/sec^2	al
1/2 (line i + line j) = ( )__ . ___ Transfer results to line bb.	Y PIPA Bias	cm/sec^2	am
1/2 (line p + line g) = ( )__ . ___ Transfer results to line bc.	Z PIPA Bias	cm/sec^2	an

DATA SHEET (x_i)

PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
NBDY	meru	-15		+15			ao
NBDZ	meru	-15		+15			ap
NBDX	meru	-15		+15			aq
ADSRAY	meru/g	-40		+40			ar
ADSRAZ	meru/g	-40		+40			as
ADSRAX	meru/g	-40		+40			at
ADIAX	meru/g	-100		+100			au
ADIAZ	meru/g	-100		+100			av
ADIAY	meru/g	-100		+100			aw
X PIPA S.F. error from line ai	PPM	-1900		+1900			ax
Y PIPA S.F. error from line aj	PPM	-1900		+1900			ay
Z PIPA S.F. error from line ak	PPM	-1900		+1900			az
X PIPA Bias from line al	cm/sec^2	-3.1		+3.1			ba
Y PIPA Bias from line am	cm/sec^2	-3.1		+3.1			bb
Z PIPA Bias from line an	cm/sec^2	-3.1		+3.1			bc

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DATA SHEET

PARAMETER	UNITS	D_1	MAX	D_2	MAX	D_3	MAX
NBDY	meru		6		9		11
NBDZ	meru		6		9		11
NBDX	meru		6		9		11
ADSRAY	meru/g		14		21		25
ADSRAZ	meru/g		14		21		25
ADSRAX	meru/g		14		21		25
ADIAX	meru/g		17		33		40
ADIAZ	meru/g		17		33		40
ADIAY	meru/g		17		33		40
X PIPA S. F. error	PPM		400		500		600
Y PIPA S. F. error	PPM		400		500		600
Z PIPA S. F. error	PPM		400		500		600
X PIPA Bias	cm/sec^2		0.5		0.7		0.9
Y PIPA Bias	cm/sec^2		0.5		0.7		0.9
Z PIPA Bias	cm/sec^2		0.5		0.7		0.9

DATA SHEET (x_{1-1})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET (x_1-2)

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S.F. error	PPM	
Y PIPA S.F. error	PPM	
Z PIPA S.F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET (x_{1-3})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S.F. error	PPM	
Y PIPA S.F. error	PPM	
Z PIPA S.F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

6.2.17 SXT-NB-IMU Fine Align Test (see Table III, Section 5)

6.2.18 Gyro Compassing Test

6.2.18.1 Set the G/N POWER-OPTICS switch on the LEB Lighting Control Panel to OPTICS. Verify that +28 vdc OPTICS OPERATE BUS (CG 1530) is +28.0±3.0 vdc. Verify that the OPTX 28V 800 cps 1% 0° (CG 1211) and OPTX 28V 800 cps 5% -90° (CG 1212) are not flashing in the CRT.

6.2.18.2 Enter the following into the CMC:

VERB 37 ENTER 01 ENTER

6.2.18.3 When PROG display changes to 02, record time as T_0.

6.2.18.4 Gyro Compassing Accuracy

6.2.18.4.1 Wait 120 minutes from T_0.

6.2.18.4.2 Using the OPTICS CONTROL STICK and a convenient CONTROLLER SPEED switch setting, carefully slew the SXT Trunnion to within +10 degrees of zero as indicated by the TPAC (Telescope Trunnion slaved to SXT). Set the OPTICS ZERO switch to ZERO.

6.2.18.4.3 Enter VERB 65, ENTER into DSKY.
Observe the PROG display on the DSKY change to 03.

6.2.18.4.4 When VERB 06 NOUN 41 flashes on the DSKY, insure R1 and R2 display Target 1 azimuth and elevation.

a. R1 = +XXX.XX (Target 1 azimuth)
b. R2 = +XX.XXX (Target 1 elevation)
c. R3 = 00001

6.2.18.4.5 Verify the data appearing in R1 and R2 and if correct, proceed. If not correct, perform the following sequence:

a. VERB 24, ENTER
b. +XXX.XX, ENTER (Target 1 azimuth)
c. ±XX.XXX, ENTER (Target 1 elevation)

6.2.18.4.6 After the correct readings for R1 and R2 are verified, enter VERB 33, ENTER into the DSKY.

6.2.18.4.7 When VERB 06 NOUN 41 flashes on the DSKY, insure that R1 and R2 display Target 2 azimuth and elevation.

a. R1 = XXX.XX (Target 2 azimuth)
b. R2 = XX.XXX (Target 2 elevation)
c. R3 = 00002.

6.2.18.4.8 Verify the data appearing in R1 and R2 and if correct, perform the following sequence:

a. VERB 24, ENTER
b. +XXX.XX, ENTER (Target 2 azimuth)
c. ±XX.XXX, ENTER (Target 2 elevation)

6.2.18.4.9 After the correct readings for R1 and R2 are verified, enter VERB 33, ENTER into the DSKY.

6.2.18.4.10 Using the Optics Hand Controller, align the SXT StLOS to Target 1 and press MARK pushbutton. If satisfied that the MARK was good, press the ENTER pushbutton. If not satisfied with MARK, press MARK REJECT pushbutton and repeat this step.

6.2.18.4.11 Set the OPTICS SPEED switch to HI. Using the Optics Hand Controller, drive the SXT StLOS to the approximate position of Target 2.

6.2.18.4.12 Set the OPTICS SPEED switch to LO. Using the Optics Hand Controller, align the SXT StLOS to Target 2 and press the MARK pushbutton. If satisfied that the MARK was good, press the ENTER pushbutton. If not satisfied, press the MARK REJECT pushbutton and repeat this step.

6.2.18.4.13 On the DSKY, observe the following data displayed:

a. VERB 06 NOUN 93
b. R1 = ±XX.XXX (X gyro elevation error, deg.)
c. R2 = ±XX.XXX (Y gyro elevation error, deg.)
d. R3 = ±XX.XXX (Z gyro azimuth error, deg.)

Record R1, R2 and R3. The X and Y gyro elevation error shall be 0.00±0.55 degrees and the Z gyro azimuth error shall be 0.00±0.3 degrees.

6.2.18.4.14 Immediately repeat steps 6.2.18.4.2 through 6.2.18.4.13 twice.

6.2.18.4.15 Repeat Steps 6.2.18.4.2 through 6.2.18.4.13 at 150, 180 and 210 minutes from T_0.

6.2.18.4.16 Enter VERB 36, ENTER into the DSKY.

6.2.18.4.17 Enter VERB 41 NOUN 20, ENTER into the DSKY. Enter +00000, ENTER into the DSKY three times. Set the G&N POWER OPTICS switch on the LEB Lighting Control Panel to OFF.

6.2.18.5 Gyro Compassing Stability

6.2.18.5.1 Calculate the average of the first three X and Y gyro elevation errors and the first three Z gyro azimuth errors.

6.2.18.5.2 The last three X and Y gyro elevation errors shall not deviate from the baseline X and Y gyro elevation errors determined above by more than ±0.15 degrees.

6.2.18.5.3 The last three Z gyro azimuth errors shall not deviate from the baseline Z gyro azimuth error determined above by more than ±0.06 degrees.

6.2.19 CMC Voltage Margin Test

6.2.19.1 Verify that the G&N IMU HTR MNA & MNB circuit breakers are engaged, Computer MNA & MNB breakers are engaged, IMU MNA & MNB circuit breakers are not engaged, and the G&N Power - IMU switch on the LEB Lighting Control Panel is in the OFF position.

6.2.19.2 On the PSA Adapter Module set the INHIBIT VOLTAGE FAIL switch to ON.

CAUTION: During the performance of this test the +4 VDC CMC Power Supply shall not be operated at less than +2.5 VDC or greater than 5.2 VDC (CG 1030). The +14 VDC CMC Power Supply shall not be operated at less than +8.5 VDC or greater than +17.0 VDC (CG 1020). Rotate the LEB LTS NUMERICS SEL to approximately center position. Decrease to absolute minimum discernable lighting.

NOTE: The flashing indication of the CMC Power Supplies on CRT may be disregarded for this test.

6.2.19.3 Into R154 insert 0001. Verify and execute.

6.2.19.3.1 Into R153 insert 1100. Verify and execute.

6.2.19.4 Into C156 insert -040001244. Verify and execute. Verify on the CRT that GV0116 is between -3.0 and -5.0 VDC.

6.2.19.5 Into C156 insert -050001234. Verify and execute. Verify on the CRT that GV0106 is between -4.0 and -6.0 VDC.

6.2.19.6 Into R154 insert 0111. Verify and execute.

6.2.19.7 Observe CG 1020, +14 VDC CMC Power Supply and CG 1030, +4 VDC CMC Power Supply, on the CRT. Repeat 6.2.19.3 through 6.2.19.6 adjusting each C-Start entry until CG 1020 is +12.1 (+0.1, -0.0) VDC and CG 1030 is +3.40 (+0.03 - 0.00) VDC.

6.2.19.8 On K-148, enter the following:

VERB 36 ENTR Wait 10 seconds.

6.2.19.9 Verify K-START tape F09C103-K10538-00 CM Self-Check Test is on the K-START tape reader.

6.2.19.9.1 Start tape reader.

6.2.19.9.2 When tape reader stops, verify:

R1 = +09XXX
R2 = +10538
R3 = -00000

6.2.19.10 Load E-Memory Program.

6.2.19.10.1 Start tape reader.

6.2.19.10.2 When tape reader stops, verify:

R1 = 00101.

6.2.19.11 Initiate Self-Check.

6.2.19.11.1 Start tape reader.

6.2.19.11.2 Wait until R3 = 00002. Verify RESTART lamp on DSKY is not lit.

6.2.19.12 Into R154 insert 0101. Verify and execute.

6.2.19.13 Set the INHIBIT VOLTAGE FAIL switch on the PSAAM to OFF. Verify the RESTART lamp on the DSKY is lit. Disregard other DSKY indications. If RESTART does not light, repeat 6.2.19.3. Verify CMC Warning master alarms are lit.

6.2.19.14 Set the INHIBIT VOLTAGE FAIL switch to ON.

6.2.19.15 Into R154 insert 0001. Verify and execute.

6.2.19.16 Into C156 insert +108001244. Verify and execute. Verify on the CRT that GV0116 is between +9.8 and +11.8 VDC.

6.2.19.17 Into R154 insert 0111. Verify and execute.

6.2.19.18 Observe CG 1020, +14 VDC CMC Power Supply on the CRT. Repeat 6.2.19.15 through 6.2.19.17 adjusting the C-Start entry until CG 1020 is 16.4 (+0.0, -0.1) VDC. Press ERR RST on K-148.

6.2.19.19 Initiate Self-Check.

6.2.19.19.1 Return K-START tape to its previous stop.

6.2.19.19.2 Start tape reader.

6.2.19.19.3 Wait until R3 = 00002. Verify RESTART lamp on DSKY is not lit.

6.2.19.20. Into R154 insert 0011. Verify and execute.

6.2.19.21 Set the INHIBIT VOLTAGE FAIL switch on the PSAAM to OFF. Verify that the DSKY RESTART lamp is lit. Disregard other DSKY indications. Verify CMC Warning master alarms are lit.

6.2.19.22 Set INHIBIT VOLTAGE FAIL switch on PSAAM to ON.

6.2.19.23 Into R154 insert 0001. Verify and execute.

6.2.19.24 Into C156 enter +092001234. Verify and execute. Verify on the CRT that GV0106 is between +8.2 and +10.2 VDC.

6.2.19.25 Into R156 insert 0111. Verify and execute.

6.2.19.26 Observe CG 1030, +4 VDC CMC Power Supply on the CRT. Repeat 6.2.19.23 through 6.2.19.25 adjusting the C-Start entry until CG 1030 is +4.60 (+0.00, -0.03) VDC. Press ERR RST on K-148.

6.2.19.27 Initiate Self-Check.

6.2.19.27.1 Return K-START tape to its previous stop.

6.2.19.27.2 Start tape reader.

6.2.19.27.3 Wait until R3 = 00002. Verify RESTART lamp on DSKY is not lit.

6.2.19.28 Into R154 insert 0101. Verify and execute.

6.2.19.29 Set the INHIBIT VOLTAGE FAIL switch on the PSAAM to OFF. Verify that the DSKY RESTART lamp is lit. Verify CMC Warning master alarms are lit.

6.2.19.30 Set the INHIBIT VOLTAGE FAIL switch on the PSAAM to ON.

6.2.19.31 Into R154 insert 0001. Verify and execute.

6.2.19.32 Into C156 insert -040001244. Verify and execute. Verify on the CRT that GV0116 is between -3.0 and -5.0 VDC.

6.2.19.33 Into R154 insert 0111. Verify and execute.

6.2.19.34 Observe CG 1020, +14 VDC CMC Power Supply on the CRT. Repeat 6.2.19.31 through 6.2.19.33 adjusting the C-Start entry until CG 1020 is +12.1 (+0.1, -0.0) VDC. Press ERR RST on K148.

6.2.19.35 Initiate Self-Check.

6.2.19.35.1 Return K-START tape to its previous stop.

6.2.19.35.2 Start tape reader.

6.2.19.35.3 Wait until R3 = 00002. Verify RESTART lamp on the DSKY is not lit.

6.2.19.36 Into R154 insert 0011. Verify and execute.

6.2.19.37 Set the INHIBIT VOLTAGE FAIL switch on the PSAAM to OFF. Verify that the DSKY RESTART lamp is lit. Disregard other DSKY indications. Verify CMC Warning master alarms are lit.

6.2.19.38 Into R154 insert 0000. Verify and execute.

6.2.19.39 Terminate CMC Self-Check by inserting into K148.

a. ERROR RESET
b. VERB 21, NOUN 27, ENTER
c. 00000, ENTER

6.2.19.40 Insure that CG 1020, +14 VDC CMC Power Supply indication, is +14.0±0.4 and that CG 1030, +4 VDC CMC Power Supply indication is +4.00±0.20 VDC on the CRT.

APPENDIX I

Signal	Link	Nomenclature	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
CG 1020	1	+14 VDC CMC SUPPLY	+14.0±0.4 VDC	0%
CG 1021	1	+14V CMC SUPPLY NOISE RMS	0.2 VRMS MAX	0%
CG 1030	1	+4 VDC CMC SUPPLY	+4.00±0.2 VDC	0%
CG 1031	1	+4V CMC SUPPLY NOISE RMS	0.2 VRMS MAX	0%
CG 1040	2	+120 VDC PIPA SUPPLY	+120±6.0 VDC	1%
CG 1042	1	+120 VDC PIPA SUP NOISE RMS	1.5 VRMS MAX	0%
CG 1051	1	+20 VDC PIPA SUPPLY	+20.0±1.2 VDC	0%
CG 1052	1	-20 VDC PIPA SUPPLY	-20±2 VDC	0%
CG 1053	1	+20 VDC PIPA SUP NOISE RMS	1.0 VRMS MAX	0%
CG 1070	1	+4 VDC CDU SUPPLY	+4.0±0.2 VDC	0%
CG 1071	1	+4 VDC CDU SUP NOISE RMS	0.1 VRMS MAX	0%
CG 1100	1	-28 VDC SUPPLY	-27.5±6.0 VDC	0%
CG 1110	2	2.5 VDC TM BIAS	+2.50±0.06 VDC	0%
CG 1201	2	IMU 28V .8KC 1% 0° RMS	28.00±0.56VRMS	1%
CG 1202	1	IMU 28V .8KC 5% - 90° RMS	28.0±1.4 VRMS	0.33%
CG 1203	1	IMU 28V .8KC 5% 0° RMS	28.0±2.1 VRMS	0.33%
CG 1207	1	PH DIFF IMU 5% 0°, -90°	-90±10°	2.3%
CG 1211	1	OPTX 28V .8KC 1% 0° RMS	28.00±0.56 VRMS	0.33%
CG 1212	1	OPTX 28V .8KC 5% - 90° RMS	28.00±1.48 VRMS	0.33%
CG 1220	1	PH DIFF OPTX 1% IMU 1%	0° ±10°	2.3%
CG 1331	2	3.2 KC 28V SUPPLY	28.6±0.56 VRMS	1%
CG 1336	1	PH DIFF 3.2 KC 28V/CMC SYNC	0° ±10°	2.3%
CG 1500	1	+28 VDC IMU OPERATE BUS	28.8±3 VDC	0%
CG 1501	1	+28V IMU OPERATE BUS NOISE RMS	1.0 VRMS MAX	0%
CG 1510	1	+28 VDC IMU STANDBY BUS	28.8±3 VDC	0%
CG 1511	1	+28V IMU STANDBY BUS NOISE RMS	1.0 VRMS MAX	0%
CG 1520	1	+28 VDC CMC OPERATE BUS	28.8±3 VDC	0%
CG 1521	1	+28V CMC OPERATE BUS NOISE RMS	2.0 VRMS MAX	0%
CG 1530	1	+28 VDC OPTX OPERATE BUS	28.8±3 VDC	0%
CG 1531	1	+28V OPTX OPERATE BUS NOISE RMS	2.0 VRMS MAX	0%
CG 2001	2	X PIPA SG O/P	5 VRMS max	3%
CG 2021	2	Y PIPA SG O/P	5 VRMS max	0.23%
CG 2041	2	Z PIPA SG O/P	5 VRMS max	3%
CG 2108	1	IG SERVO ERROR QUAD	0.0±1.2 VRMS	3.6%
CG 2112	2	IG 1X RESOLVER O/P SIN	18.38±1.84 VRMS @ 45°	2.5%
CG 2113	2	IG 1X RESOLVER O/P COS	18.38±1.84 VRMS @ 45°	2.5%
CG 2117	2	IG SERVO ERROR IN PHASE	0.0±60 mv RMS @ null	1.4%
CG 2120	1	IG TORQUE MOTOR CURRENT	0.125 amp max during Fine Alignment Torquing	0%

PSAAM OUTPUT is the source of Link 1 signals. SCA OUTPUT is the source of Link 2 signals.

APPENDIX I (Continued)

Signal	Link	Nomenclature	G&N Test Requirements	PSAAM and/or SCA Uncertainty % of Full Scale
CG 2138	1	MG SERVO ERROR QUAD	0.0±1.2 VRMS	3.6%
CG 2142	2	MG 1X RESOLVER O/P SIN	18.38±1.84 VRMS @ 45°	2.5%
CG 2143	2	MG 1X RESOLVER O/P COS	18.38±1.84 VRMS @ 45°	2.5%
CG 2147	2	MG SERVO ERROR IN PHASE	0.0±60 mv rms @ null	1.4%
CG 2150	1	MG TORQUE MOTOR CURRENT	0.125 amp max during Fine Align Torquing	0%
CG 2168	1	OG SERVO ERROR QUAD	0.0±1.2 VRMS	3.6%
CG 2172	2	OG 1X RESOLVER O/P SIN	18.38±1.84 VRMS @ 45°	2.5%
CG 2173	2	OG 1X RESOLVER O/P COS	18.38±1.84 VRMS @ 45°	2.5%
CG 2177	2	OG SERVO ERROR IN PHASE	0.0±60 mv RMS @ null	1.4%
CG 2180	1	OG TORQUE MOTOR CURRENT	0.125 amp max during Fine Align Torquing	0%
CG 2219	1	PITCH ATT ERROR-CDU DAC O/P	5.06±0.5 VRMS @ 17°	0.67%
CG 2220	1	IG CDU FINE ERROR	0.0±0.07 VRMS @ null	0.29%
CG 2221	1	IG CDU COARSE ERROR	0.0±0.68 VRMS at null	0.29%
CG 2249	1	YAW ATT ERROR-CDU DAC O/P	5.06±0.5 VRMS at 17°	0.67%
CG 2250	1	MG CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 2251	1	MG CDU COARSE ERROR	0.0±0.68 VRMS at null	0.29%
CG 2279	1	ROLL ATT ERROR-CDU DAC O/P	5.06±0.5 VRMS at 17°	0.67%
CG 2280	1	OG CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 2281	1	OG CDU COARSE ERROR	0.0±0.68 VRMS	0.29%
CG 2300	2	PIPA TEMPERATURE	130.5±1.5° F Operate Mode	2%
CG 2301	1	IRIG TEMPERATURE	135±2.5° F in Operate	2%
CG 3011	1	TRUNNION CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 3021	1	SHAFT CDU FINE ERROR	0.0±0.07 VRMS at null	0.29%
CG 3117	1	SXT SHAFT SERVO ERROR IN PH	-0.25 to -2.00 VRMS at Hi Rate	1.1%
CG 3118	1	SXT TRUNNION SERVO ERROR IN PH	-0.25 to -2.00 VRMS at Hi Rate	1.1%
CG 3140	1	SXT SHAFT TACH O/P	3.3±1.3 VRMS at Hi Rate	1.1%
CG 3145	1	SXT SHAFT MTR CONTROL WINDING	+0.5 to 4.00 VRMS at Med Rate	1.1%
CG 3150	1	SXT TRUNNION TACH O/P	3.3±1.3 VRMS at Hi Rate	1.1%
CG 3155	1	SXT TRUNNION MTR CONTROL WINDING	+0.25 to +2.00 VRMS at Med Rate	1.1%

APPENDIX I (Continued)

Signal	Link	Nomenclature	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
CG 3160	1	SCT SHAFT TACK O/P	3.3±1.3 VRMS at Hi Rate	1.1%
CG 3170	1	SCT TRUNNION TACH O/P	0.85±0.35 VRMS at Hi Rate	1.1%
CG 3721	2	SHAFT CDU DAC O/P	10.12±1.00 VRMS at 17°	1%
CG 3722	2	TRUNNION CDU DAC O/P	10.12±1.00 VRMS at 17°	1%
CG 4300	1	CMC TEMP	87.5±42.5° F	0.23%
CG 6020	1	PIPA CAL MODULE TEMP	72.5±27.5° F	0.23%
CG 6021	1	IMU 800 cps 5% TEMP (PSA)	90±30° F	0%

1.0 INTRODUCTION

1.1 The individual Spacecraft (SC) installed Guidance and Navigation (G&N) System to be checked out per this process specification shall consist of one of each of the following major assemblies. The applicable part numbers shall be determined by Drawing No. 6014999.

Assembly Name

1 - Apollo Guidance Computer Group

1 - Inertial Meas. Unit & Pulse Torque Assembly

1 - Coupling Data Unit

1 - Power and Servo Assembly

1 - Computer Control & Reticle Dimmer Assembly

1 - G&N Interconnect Harness Assembly (LEM)

1 - Signal Conditioner Assembly

1 - Navigation Base Assembly (LEM)

1 - Alignment Optical Telescope (LEM)

1.2 The G&N System herein shall be identified as a LM system. The computer contains the program flight ropes in the core rope memory. The test requirements herein are based on LUMINARY 50.

2.0 SCOPE

2.1 This specification outlines the checkout requirements for G&N System installed in a Lunar Module Vehicle. Addendum to this specification will cover any special checkout requirements associated with individual vehicles, G&N Systems and Computer Flight Programs.

6.3.2.2.1 (Continued)

```
00001          ENTR
01776          ENTR
00006          ENTR
VERB 31        ENTR
```

6.3.2.2.2 Verify RESTART lamp is ON.

6.3.2.2.3 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.2.3 TC Trap Test

6.3.2.3.1 On K-148 enter the following sequence:

```
VERB 21 NOUN 01 ENTR
01470           ENTR
31474           ENTR
NOUN 15         ENTR
54067           ENTR ENTR
54001           ENTR ENTR
14767           ENTR ENTR
00067           ENTR ENTR
VERB 25 NOUN 26 ENTR
35000           ENTR
01470           ENTR
00003           ENTR
VERB 30         ENTR
```

6.3.2.3.2 Verify RESTART lamp is ON.

6.3.2.3.3 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.2.3.4 On K-148 enter the following sequence:

```
VERB 21 NOUN 01 ENTR
01470           ENTR
30067           ENTR
NOUN 15         ENTR
31474           ENTR ENTR
22000           ENTR ENTR
22005           ENTR ENTR
01470           ENTR
VERB 25 NOUN 26 ENTR
36000           ENTR
01470           ENTR
00003           ENTR
VERB 30         ENTR
```

6.3.2.3.5 Verify RESTART lamp is ON.

6.3.2.3.6 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.2.4 Nightwatchman Test

6.3.2.4.1 On K-148 enter the following sequence:

```
VERB 24 NOUN 01 ENTR
03376           ENTR
30001           ENTR
01776           ENTR
VERB 25 NOUN 26 ENTR
04000           ENTR
01776           ENTR
00006           ENTR
VERB 30         ENTR
```

6.3.2.4.2 Verify RESTART lamp is ON.

6.3.2.4.3 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.3 IMU Operate Power On Tests

CAUTION: Prior to application of IMU OPERATE power in step 6.3.3.1.4, LGC OPERATE and IMU STANDBY power must have been applied to the G&N System continuously for a minimum of two hours. The only exception is when the requirements of step 6.2.4.14 are met and this does not apply for the initial application of IMU OPERATE power.

6.3.3.1 Verification of Power Turn-On

6.3.3.1.1 Set up analog recorder to monitor the following signals:

SIGNAL NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2106	IG Servo Error Total
c. GG 2166	OG Servo Error Total
d. GG 2112	IG 1X Resolver Sine
e. GG 2172	OG 1X Resolver Sine
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1% 800 cps
h. SPARE	

6.3.3.1.2 On CRT, monitor +120 VDC PIPA SUPPLY (GG 1040) and IMU gimbal angles.

6.3.3.1.3 Press in +28 VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11. Record time.

6.3.3.1.3.1 Verify that the "NO ATT" lamp on the DSKY is lighted.

6.3.3.1.4 Verify on analog recorder that the oscillations of the resolver sine signals (GG 2112, GG 2172, and GG 2142) are not sustained and that the signals damp out within 15 seconds. If they don't, remove IMU OPERATE power as soon as possible.

6.3.3.1.5 On the CRT, verify absence of +120 VDC PIPA SUPPLY voltage for 90±10 seconds after step 6.3.3.1.3 is initiated. Verify that this voltage is between 114 and 126 after 100 seconds from step 6.3.3.1.3.

6.3.3.1.6 On event recorder verify the following:

LGC WARNING is OFF (GG 9001)
ISS WARNING is OFF (GG 9002)

6.3.3.1.6.1 On DSKY, verify that the "NO ATT" lamp is off.

6.3.3.1.7 On CRT, verify all IMU gimbal angles indicate approximately 0 degrees.

6.3.3.1.8 On K-148 enter the following sequence:

```
VERB 41 NOUN 20 ENTR
+00000          ENTR
+00000          ENTR
+00000          ENTR
```

6.3.4 Temperature Control Verification

6.3.4.1 After IMU OPERATE turn-on, periodically check the PIPA TEMP for the next 15 minutes. The PIPA TEMP shall be 130.5±2.0°F. Fifteen (15) minutes after IMU OPERATE turn on the PIPA temperature shall be within 0.5°F of its stabilized value (para 6.3.4.3).

6.3.4.2 When 1 hour has elapsed from the time of IMU OPERATE power turn-on, monitor PIPA TEMP (GG 2300) on the CRT. Monitor and record temperature readings every 5 minutes for 30 minutes. Verify that each reading does not deviate from the average value of each signal by more than 0.1°F.

6.3.4.3 The PIPA Temp shall be 130.5±1.5°F.

6.3.4.4 Verify on the event recorder that IMU Blower Current (GG 2303) and IMU Heater Current (GG 2302) On discretes have been present for the last hour (discretes may cycle off).

6.3.5 PGNCS Power Supply Tests

6.3.5.1 From the CRT, confirm power supply voltages (or temperatures) are as specified and record values observed.

6.3.5.2 The PIPA Calibration Module Temperature (GG 6020) shall be between +45 and +90 DEG F.

6.3.5.3 The PSA Temperature (GG 6021) shall be between +60 and +110 DEG F.

6.3.5.4 The LGC Temperature (GG 4300) shall be between +45 and +130 DEG. F.

6.3.5.5 The +28 VDC IMU OPERATE BUS (GG 1500) shall be between 24.5 and 33.5 VDC.

6.3.5.6 The +28 VDC IMU STANDBY BUS (GG 1510) shall be between 23.5 and 32.5 VDC.

6.3.5.7 The +28 VDC LGC OPERATE BUS (GG 1520) shall be between 24.5 and 33.5 VDC.

6.3.5.8 The +120 VDC PIPA Supply (GG 1040) shall be between 114 and 126 VDC.

6.3.5.9 The -28 VDC Supply (GG 1100) shall be between -21.5 and -33.5 VDC.

6.3.5.10 The +4 VDC CDU Supply (GG 1070) shall be between 3.8 and 4.2 VDC.

6.3.5.11 The IMU 28V 800 CPS 1 pct Supply (GG 1201) shall be between 27.44 and 28.56 VRMS.

6.3.5.12 The IMU 28V 800 CPS 5 pct 90 PH Supply (GG 1202) shall be between 26.6 and 29.4 VRMS.

6.3.5.13 The IMU 28V 800 CPS 5 pct 0 PH Supply (GG 1203) shall be between 25.9 and 30.1 VRMS.

6.3.5.14 The 3.2 KC 28V Supply (GG 1331) shall be between 28.04 and 29.16 VRMS.

6.3.5.15 The 2.5 VDC T/M Bias (GG 1110) shall be between 2.44 and 2.56 VDC.

6.3.5.16 The +14 VDC LGC Supply (GG 1020) shall be between 13.6 and 14.4 VDC.

6.3.5.17 The +4 VDC LGC Supply (GG 1030) shall be between 3.8 and 4.2 VDC.

6.3.5.18 The phase difference between the 3.2 KC supply and LGC sync shall be 0±10° (NG 1336).

6.3.5.19 Record the noise levels of the following signals displayed on the CRT.

Item No.	Measurement No.	Signal	Requirement
a.	NG 1021	14 VDC LGC Noise RMS	<0.2 VRMS
b.	NG 1031	4 VDC LGC Noise RMS	<0.2 VRMS
c.	NG 1071	4 VDC CDU Noise RMS	<0.1 VRMS
d.	NG 1501	28 VDC IMU Operate Noise RMS	<1.0 VRMS
e.	NG 1511	28 VDC IMU Standby Noise RMS	<1.0 VRMS
f.	NG 1521	28 VDC LGC Operate Noise RMS	<2.0 VRMS

6.3.5.20 The noise peaks of the following signals are demonstrated on the event light when the peaks have a rise time between 2 and 50 μsec and the peak

6.3.5.20 (Cont) voltage exceeds 5 volts.

Item No.	Measurement No.	Signal
a.	NG 1022	14 VDC LGC Noise Peak
b.	NG 1032	4 VDC LGC Noise Peak
c.	NG 1072	4 VDC CDU Noise Peak
d.	NG 1502	28 VDC IMU Operate Noise Peak
e.	NG 1522	28 VDC LGC Operate Peak

6.3.5.21 The noise peaks of the following signals are demonstrated on the event light when the peaks have a rise time of between 2 and 50 μsec and the peak voltage exceeds 10 volts.

a.	NG 1512	28 VDC IMU Standby Peak.

6.3.6 G&N Operational Test

NOTE: Manual DSKY entries during this test may result in a test abort.

6.3.6.1 Verify K-START tape F10L004-K10531-XX LM G/N OPCHK is on K-START tape reader, where XX equals tape revision number

6.3.6.1.1 Start tape reader.

6.3.6.1.2 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +10XXX
b. R2 = +10531 (tape number)
c. R3 = -000XX (tape revision number)

6.3.6.2 E-Memory Program Load and Sum Check

6.3.6.2.1 Start tape reader.

6.3.6.2.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00101.

6.3.6.3 Local g Measurement.

6.3.6.3.1 Start tape reader.

6.3.6.3.2 In approximately 10 minutes, VERB 06 NOUN 98 shall flash.

6.3.6.3.3 From the CRT DSKY display read and record Row 1 and Row 2 (local gravity whole and fractional respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.3.6.4 Horizontal Earth Rate Measurement

6.3.6.4.1 Press PRO pushbutton on DSKY.

6.3.6.4.2 In approximately 2 seconds VERB 06 NOUN 98 shall flash. From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.3.6.5 Enter the following on K-148:

VERB 34	ENTR
VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR

6.3.7 Semi-Automatic Mode Test

6.3.7.1 Verify K-START Tape F10L004-K10530-XX LM Semi-Automatic Mode Test is on K-START tape reader, where XX equals tape revision number.

6.3.7.1.1 Start tape reader.

6.3.7.1.2 When tape reader stops verify the following on CRT DSKY

a. R1 = +10XXX
b. R2 = +10530 (tape number)
c. R3 = -000XX (tape revision number)

6.3.7.2 E-Memory Program Load

6.3.7.2.1 Start tape reader.

6.3.7.2.2 When tape reader stops verify the following on CRT DSKY:

R1 = 00101

6.3.7.3 Command Accuracy 0°.

6.3.7.3.1 Start tape reader.

6.3.7.3.2 When tape stops verify that CRT DSKY R1 indicates 00201. Wait 15 seconds.

6.3.7.3.3 Read and record CRT IMU Gimbal angles. The indications shall be 000±003 degrees.

6.3.7.3.4 Read and record CRT CDU angle indications. The indications shall be +000.00±001.50.

6.3.7.4 Command Accuracy 45°.

6.3.7.4.1 Start tape reader.

6.3.7.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00301. Wait 5 seconds.

6.3.7.4.3 Read and record CRT IMU Gimbal angles. The indications shall be 045±003 degrees.

6.3.7.4.4 Read and record CRT CDU angle indications. Indications shall be +045.00±001.50.

6.3.7.5 CDU Repeating Accuracy 45°.

6.3.7.5.1 Start the tape reader.

6.3.7.5.2 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.3.7.6 Command Accuracy 90°.

6.3.7.6.1 Start tape reader.

6.3.7.6.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00501. GIMBAL LOCK lamp will be lit. Wait 5 seconds.

6.3.7.6.3 Read and record CRT indication of IMU Gimbal angles. The indications shall be 090±003 degrees.

6.3.7.6.4 Read and record CRT CDU angle indications. Indications shall be +090.00±001.50.

6.3.7.7 Command Accuracy 135°.

6.3.7.7.1 Start tape reader.

6.3.7.7.2 When tape reader stops verify CRT DSKY Row 1 indicates 00601. Wait 5 seconds.

6.3.7.7.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 135±003 degrees.

6.3.7.7.4 Read and record CRT CDU angle indications. Indications shall be +135.00±001.50.

6.3.7.8 CDU Repeating Accuracy 135°.

6.3.7.8.1 Start tape reader.

6.3.7.8.2 When tape reader stops verify CRT DSKY Row 1 indicates 00701. Wait 10 seconds, verify GIMBAL LOCK lamp on DSKY is not lit.

6.3.7.8.3 Start tape reader.

6.3.7.8.4 Approximately 5 seconds after tape reader stops VERB 06 NOUN 01 will flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.3.7.9 Plus Gimbal Lock Test.

6.3.7.9.1 Start tape reader.

6.3.7.9.2 When tape reader stops wait approximately 10 seconds. Verify CRT DSKY Row 1 indicates 01101. Verify GIMBAL LOCK lamp is lit.

6.3.7.10 Command Accuracy 225°.

6.3.7.10.1 Start tape reader.

6.3.7.10.2 When tape reader stops verify CRT DSKY Row 1 indicates 01201. GIMBAL LOCK lamp will be lit. Wait 15 seconds.

6.3.7.10.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 225±003 degrees.

6.3.7.10.4 Read and record CRT CDU angle indications. Indications shall be +225.00±001.50.

6.3.7.11 CDU Command Rate Test

6.3.7.11.1 Start tape reader.

6.3.7.11.2 When tape reader stops verify CRT DSKY display Row 1 indicates 01301. Wait 10 seconds. Verify IMU Gimbals are at approximately 0°.

6.3.7.11.3 Middle Gimbal Rate Test

6.3.7.11.3.1 Start tape reader.

6.3.7.11.3.2 When tape reader stops immediately verify display of 01401 in Row 1 of CRT DSKY display. In approximately 12 seconds VERB 23 NOUN 26 shall flash. The GIMBAL LOCK lamp shall be lit. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.3.7.11.4 Inner Gimbal Rate Test

6.3.7.11.4.1 Start tape reader.

6.3.7.11.4.2 Approximately 12 seconds after the tape reader stops VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.3.7.11.5 Outer Gimbal Rate Test.

6.3.7.11.5.1 Start tape reader.

6.3.7.11.5.2 Approximately 12 seconds after the tape reader stops VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.3.7.11.6 Start tape reader.

6.3.7.11.6.1 Wait 15 seconds. Verify IMU Gimbals are at approximately 0°.

6.3.7.12 Command Accuracy 315°.

6.3.7.12.1 Start tape reader.

6.3.7.12.2 When tape reader stops verify CRT DSKY Row 1 indicates 01501.

6.3.7.12.3 Read and record CRT IMU Gimbal Angles. Indication shall be 315±003 degrees.

6.3.7.12.4 Read and record CRT CDU angle indications. Indications shall be +315.00±001.50.

6.3.7.13 CDU Repeating Accuracy 315°.

6.3.7.13.1 Start tape reader.

6.3.7.13.2 Approximately 5 seconds after the tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.3.7.14 Minus Gimbal Lock Test.

6.3.7.14.1 Start tape reader.

6.3.7.14.2 When tape reader stops verify CRT DSKY Row 1 indicates 01701. Verify GIMBAL LOCK lamp is lit after approximately 5 seconds.

6.3.7.15 CDU Repeating Accuracy 225°.

6.3.7.15.1 Start tape reader.

6.3.7.15.2 When tape reader stops verify CRT DSKY Row 1 indicates +00016. Wait 10 seconds before continuing.

6.3.7.15.3 Start tape reader.

6.3.7.15.4 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 will flash. Read and record CRT DSKY Row 1, 2 and 3 indications. Recorded values shall be between 77770 and 00007.

6.3.7.16 OG CDU Fine Fail Test.

6.3.7.16.1 Start tape reader.

6.3.7.16.2 When tape reader stops verify CRT DSKY Row 1 indicates 02101.

6.3.7.16.3 Start tape reader.

6.3.7.16.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes, verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.16.5 Start tape reader.

6.3.7.16.6 Approximately 4 seconds after tape reader stops, verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.17 IG CDU Fine Fail Test

6.3.7.17.1 Start tape reader.

6.3.7.17.2 When tape reader stops verify CRT DSKY Row 1 indicates 02201.

6.3.7.17.3 Start tape reader.

6.3.7.17.4 Approximately 10 seconds after the tape reader stops, VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes, verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.17.5 Start tape reader.

6.3.7.17.6 Approximately 4 seconds after tape reader stops, verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.18 MG CDU Fine Fail Test.

6.3.7.18.1 Start tape reader.

6.3.7.18.2 When tape reader stops verify CRT DSKY Row 1 indicates 02301.

6.3.7.18.3 Start tape reader.

6.3.7.18.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify, ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.18.5 Start tape reader.

6.3.7.18.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.19 OG CDU Coarse Fail Test

6.3.7.19.1 Start tape reader.

6.3.7.19.2 When tape reader stops verify CRT DSKY Row 1 indicates 02401.

6.3.7.19.3 Start tape reader.

6.3.7.19.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.19.5 Start tape reader.

6.3.7.19.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.20 IG CDU Coarse Fail Test

6.3.7.20.1 Start tape reader.

6.3.7.20.2 When tape reader stops verify CRT DSKY Row 1 indicates 02501.

6.3.7.20.3 Start tape reader.

6.3.7.20.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.20.5 Start tape reader.

6.3.7.20.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.21 MG CDU Coarse Fail Test

6.3.7.21.1 Start tape reader.

6.3.7.21.2 When tape reader stops verify CRT DSKY Row 1 indicates 02601.

6.3.7.21.3 Start tape reader.

6.3.7.21.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.21.5 Start tape reader.

6.3.7.21.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.22 FDAI Linearity Test.

6.3.7.22.1 Start tape reader.

6.3.7.22.2 When tape reader stops verify that CRT DSKY Row 1 indicates 02701. Wait 5 seconds.

6.3.7.22.3 Start tape reader.

6.3.7.22.4 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates +00017.
PITCH ATT ERROR is between +15.3 and +18.7 DEG (GG 2219)
YAW ATT ERROR is between +15.3 and +18.7 DEG (GG 2249)
ROLL ATT ERROR is between +15.3 and +18.7 DEG (GG 2279)

6.3.7.22.5 Start tape reader.

6.3.7.22.6 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates +00016.
PITCH ATT ERROR is between +14.4 and +17.6 DEG (GG 2219)
YAW ATT ERROR is between +14.4 and +17.6 DEG (GG 2249)
ROLL ATT ERROR is between +14.4 and +17.6 DEG (GG2279)

6.3.7.22.7 Start tape reader.

6.3.7.22.8 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates +00006.
PITCH ATT ERROR is between +05.4 and +06.6 DEG (GG 2219)
YAW ATT ERROR is between +05.4 and +06.6 DEG (GG 2249)
ROLL ATT ERROR is between +05.4 and +06.6 DEG (GG 2279)

6.3.7.22.9 Start tape reader.

6.3.7.22.10 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates +00000.
PITCH ATT ERROR is between +00.2 and -00.2 DEG (GG 2219)
YAW ATT ERROR is between +00.2 and -00.2 DEG (GG 2249)
ROLL ATT ERROR is between +00.2 and -00.2 DEG (GG 2279)

6.3.7.22.11 Start tape reader.

6.3.7.22.12 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates -00006.
PITCH ATT ERROR is between -05.4 and -06.6 DEG (GG 2219)
YAW ATT ERROR is between -05.4 and -06.6 DEG (GG 2249)
ROLL ATT ERROR is between -05.4 and -06.6 DEG (GG 2279)

6.3.7.22.13 Start tape reader.

6.3.7.22.14 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates -00016.
PITCH ATT ERROR is between -14.4 and -17.6 DEG (GG 2219)
YAW ATT ERROR is between -14.4 and -17.6 DEG (GG 2249)
ROLL ATT ERROR is between -14.4 and -17.6 DEG (GG 2279)

6.3.7.22.15 Start tape reader.

6.3.7.22.16 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates -00017.
PITCH ATT ERROR is between -15.3 and -18.7 DEG (GG 2219)
YAW ATT ERROR is between -15.3 and -18.7 DEG (GG 2249)
ROLL ATT ERROR is between -15.3 and -18.7 DEG (GG 2279)

6.3.7.23 On K-148 enter VERB 34 ENTER

The proper operation of the IMU CAGE function (consisting of steps 6.3.7.23.1 through 6.3.7.23.7) need be performed only once during the initial PGNCS Operational Test and omitted from subsequent testing of test 6.3.7.

6.3.7.23.1 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00200 ENTR
+00200 ENTR
+00200 ENTR

6.3.7.23.2 Observe that the NO ATT lamp on the DSKY lights and that the CDUX, CDUY and CDUZ angles on the CRT indicate approximately +00200.

6.3.7.23.3 On analog recorder, monitor the following signals:

Signal No.	Signal Name
a. GG 2136	MG Servo Error Total
b. GG 2106	IG Servo Error Total
c. GG 2166	OG Servo Error Total
d. GG 2112	IG 1X Resolver Sine
e. GG 2172	OG 1X Resolver Sine
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1% 800 cps

6.3.7.23.4 Start analog recorder to a chart speed of 5 mm/sec.

6.3.7.23.5 On LEM Cabin Panel 4, hold IMU CAGE momentary toggle switch in the ON position. (Do not release).

6.3.7.23.6 On analog recorder, verify the 1X Resolver Sine signals (GG 2112, GG 2172, GG 2142) null out to less than 0.5 VRMS. Release IMU CAGE switch to the OFF position. Disregard any momentary transients on the 1X Resolver Sine signals when the switch is released. Any sustained oscillations shall be cause for immediate removal of IMU Operate Power.

6.3.7.23.7 On the CRT, verify that the CDUX, CDUY and CDUZ angles are all between +00150 and +35850.

6.3.7.24 Stop analog recorder.

6.3.7.24.1 On K-148 enter the following:

VERB 36 ENTR wait 10 seconds
VERB 43 ENTR
+01700 ENTR

6.3.7.24.1 (Cont)

+00600 ENTR
-01700 ENTR

On CRT, verify the following:

YAW ATT ERROR is between +15.3 and +18.7 DEG (GG 2249)
PITCH ATT ERROR is between +05.5 and +06.6 DEG (GG 2219)
ROLL ATT ERROR is between -15.3 and -18.7 DEG (GG 2279)

6.3.7.25 On K-148 enter the following:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.8 IRIG Scale Factor Test

6.3.8.1 Verify K-START Tape F10L004-K00083-XX IRIG Scale Factor Test is on the K-START tape reader. XX equals tape revision number.

6.3.8.2 Start tape reader.

6.3.8.2.1 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +10XXX
b. R2 = +00083 (tape number)
c. R3 = -000XX (tape revision number)

6.3.8.2.2 Start tape reader.

6.3.8.2.3 When tape reader stops, wait 20 seconds.

6.3.8.3 E-Memory Program Load.

6.3.8.3.1 Start tape reader.

6.3.8.3.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00000.

6.3.8.4 Test Position Data Load (+X Scale Factor)

6.3.8.4.1 Start tape reader.

6.3.8.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.3.8.4.3 Start tape reader

6.3.8.4.4 When tape reader stops, VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nave Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.4.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.4.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001).

6.3.8.5 Test Position Data Load (+Y Scale Factor)

6.3.8.5.1 Start tape reader.

6.3.8.5.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.3.8.5.3 Start tape reader.

6.3.8.5.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.5.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.5.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.3.8.6 Test Position Data Load (+Z Scale Factor).

6.3.8.6.1 Start tape reader.

6.3.8.6.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.3.8.6.3 Start tape reader.

6.3.8.6.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.6.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.6.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.3.8.7 Test Position Data Load (-X Scale Factor)

6.3.8.7.1 Start tape reader.

6.3.8.7.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.3.8.7.3 Start tape reader.

6.3.8.7.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.7.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.7.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.3.8.8 Test Position Data Load (-Y Scale Factor)

6.3.8.8.1 Start tape reader.

6.3.8.8.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.3.8.8.3 Start tape reader.

6.3.8.8.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTER into K-148 and enter correct azimuth.

6.3.8.8.4 (continued) If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.8.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.8.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.3.8.9 Test Position Data Load (-Z Scale Factor)

6.3.8.9.1 Start tape reader.

6.3.8.9.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.3.8.9.3 Start tape reader.

6.3.8.9.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.9.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.9.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.3.8.10 Test Position Data Load (+X Scale Factor)

6.3.8.10.1 Start tape reader.

6.3.8.10.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.3.8.10.3 Start tape reader.

6.3.8.10.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.10.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.10.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.3.8.11 Test Position Data Load (+Y Scale Factor)

6.3.8.11.1 Start tape reader.

6.3.8.11.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.3.8.11.3 Start tape reader.

6.3.8.11.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.11.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.11.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.3.8.12 Test Position Data Load (+Z Scale Factor)

6.3.8.12.1 Start tape reader.

6.3.8.12.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.3.8.12.3 Start tape reader.

6.3.8.12.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.12.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.12.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.3.8.13 Test Position Data Load (-X Scale Factor)

6.3.8.13.1 Start tape reader.

6.3.8.13.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.3.8.13.3 Start tape reader.

6.3.8.13.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.13.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.13.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.3.8.14 Test Position Data Load (-Y Scale Factor)

6.3.8.14.1 Start tape reader.

6.3.8.14.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.3.8.14.3 Start tape reader.

6.3.8.14.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.14.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.14.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.3.8.15 Test Position Data Load (-Z Scale Factor)

6.3.8.15.1 Start tape reader.

6.3.8.15.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.3.8.15.3 Start tape reader.

6.3.8.15.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

6.3.8.15.4 (continued) If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.15.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.15.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.3.8.16 Test Position Data Load (+X Scale Factor)

6.3.8.16.1 Start tape reader.

6.3.8.16.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00001.

6.3.8.16.3 Start tape reader.

6.3.8.16.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.16.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.16.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.3.8.17 Test Position Data Load (+Y Scale Factor)

6.3.8.17.1 Start tape reader.

6.3.8.17.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.3.8.17.3 Start tape reader.

6.3.8.17.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.17.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.17.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.3.8.18 Test Position Data Load (+Z Scale Factor)

6.3.8.18.1 Start tape reader.

6.3.8.18.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.3.8.18.3 Start tape reader.

6.3.8.18.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.18.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.18.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.3.8.19 Test Position Data Load (-X Scale Factor)

6.3.8.19.1 Start tape reader.

6.3.8.19.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.3.8.19.3 Start tape reader.

6.3.8.19.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.19.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.19.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.3.8.20 Test Position Data Load (-Y Scale Factor)

6.3.8.20.1 Start tape reader.

6.3.8.20.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.3.8.20.3 Start tape reader.

6.3.8.20.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth,

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude,

6.3.8.20.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.20.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.3.8.21 Test Position Data Load (-Z Scale Factor)

6.3.8.21.1 Start tape reader.

6.3.8.21.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.3.8.21.3 Start tape reader.

6.3.8.21.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.21.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.21.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.3.8.22 Test Position Data Load (+X Scale Factor)

6.3.8.22.1 Start tape reader.

6.3.8.22.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00001.

6.3.8.22.3 Start tape reader.

6.3.8.22.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

6.3.8.22.4 (continued) If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.22.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.22.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.3.8.23 Test Position Data Load (+Y Scale Factor)

6.3.8.23.1 Start tape reader.

6.3.8.23.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.3.8.23.3 Start tape reader.

6.3.8.23.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.23.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.23.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.3.8.24 Test Position Data Load (+Z Scale Factor)

6.3.8.24.1 Start tape reader.

6.3.8.24.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.3.8.24.3 Start tape reader.

6.3.8.24.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.24.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.24.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.3.8.25. Test Position Data Load (-X Scale Factor)

6.3.8.25.1 Start tape reader.

6.3.8.25.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.3.8.25.3 Start tape reader.

6.3.8.25.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.25.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.25.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.3.8.26 Test Position Data Load (-Y Scale Factor)

6.3.8.26.1 Start tape reader.

6.3.8.26.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.3.8.26.3 Start tape reader.

6.3.8.26.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX. XX Nav Base Azimuth
R2 = XX. XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.26.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.26.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.3.8.27 Test Position Data Load (-Z Scale Factor)

6.3.8.27.1 Start tape reader.

6.3.8.27.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.3.8.27.3 Start tape reader.

6.3.8.27.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX. XX Nav Base Azimuth
R2 = XX. XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.27.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.27.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.3.8.28 Terminate this test by entering the following into K-148:

VERB 36 ENTR Wait 10 seconds.
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.8.29 The four-run average Scale Factor Error for each of the six positions shall be 0 plus or minus 1750 ppm.

6.3.9 IMU Performance Test. A reference data sheet is provided at the end of this section to aid in data reduction.

6.3.9.1 Insure that IMU Operate power and LGC Operate power has been supplied for a minimum of one hour and that the IMU is not in a Gimbal Lock condition.

6.3.9.2 On CRT, monitor and record PIPA TEMP (CG 2300).

6.3.9.3 Verify K-START Tape F10L004-K00081-XX IMU Performance test is on the tape reader. XX equals tape revision number

6.3.9.4 Start tape reader.

6.3.9.4.1 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +10XXX
b. R2 = +00081 (tape number)
c. R3 = -000XX (tape revision number)

6.3.9.4.2 Start tape reader.

6.3.9.4.3 When tape reader stops, wait 10 seconds.

6.3.9.5 Start the tape reader. After 15 seconds, verify IMU is coarse aligned to zero degrees.

6.3.9.6 E-Memory Program Load.

6.3.9.6.1 Start the tape reader. When tape reader stops, verify the following DSKY display:

Row 1
Row 3

6.3.9.7 Test Position +00001.

6.3.9.7.1 E-Memory Program and Test Position Matrix Sum Check

6.3.9.7.1.1 Start tape reader.

6.3.9.7.1.2 When tape reader stops, verify DSKY Row 1 displays +00001.

6.3.9.7.2 Start tape reader.

6.3.9.7.2.1 When tape reader stops wait 20 seconds.

6.3.9.7.3 Test Initialization.

6.3.9.7.3.1 Start tape reader.

6.3.9.7.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.7.4 Horizontal Drift Test

6.3.9.7.4.1 Start tape reader.

6.3.9.7.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.7.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.7.5 Test Termination.

6.3.9.7.5.1 Start tape reader.

6.3.9.7.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.8 Test Position +00002.

6.3.9.8.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.8.1.1 Start tape reader.

6.3.9.8.1.2 When tape reader stops, verify DSKY Row 1 displays +00002.

6.3.9.8.2 Start tape reader.

6.3.9.8.2.1 When tape reader stops, wait 20 seconds.

6.3.9.8.3 Test Initialization.

6.3.9.8.3.1 Start tape reader.

6.3.9.8.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.8.4 Horizontal Drift Test.

6.3.9.8.4.1 Start tape reader.

6.3.9.8.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.8.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.8.5 PIPA Scale Factor Test.

6.3.9.8.5.1 Start tape reader.

6.3.9.8.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.3.9.8.6 Vertical Drift Test.

6.3.9.8.6.1 Start tape reader.

6.3.9.8.6.2 In approximately 67 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.3.9.8.7 Test Termination.

6.3.9.8.7.1 Start tape reader.

6.3.9.8.7.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.9 Test Position +00003.

6.3.9.9.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.9.1.1 Start tape reader.

6.3.9.9.1.2 When tape reader stops, verify DSKY Row 1 displays +00003.

6.3.9.9.2 Start tape reader.

6.3.9.9.2.1 When tape reader stops, wait 20 seconds.

6.3.9.9.3 Test Initialization.

6.3.9.9.3.1 Start tape reader.

6.3.9.9.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.9.4 Horizontal Drift Test

6.3.9.9.4.1 Start tape reader.

6.3.9.9.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.9.4.3 In approximately 14 minutes, VERB 06 NOUN 96 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.9.5 Test Termination.

6.3.9.9.5.1 Start tape reader.

6.3.9.9.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.10 Test Position +00004.

6.3.9.10.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.10.1.1 Start tape reader.

6.3.9.10.1.2 When tape reader stops, verify DSKY Row 1 displays +00004.

6.3.9.10.2 Start tape reader.

6.3.9.10.2.1 When tape reader stops, wait 20 seconds.

6.3.9.10.3 Test Initialization.

6.3.9.10.3.1 Start tape reader.

6.3.9.10.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.10.4 Horizontal Drift Test.

6.3.9.10.4.1 Start tape reader.

6.3.9.10.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.10.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.3.9.10.5 PIPA Scale Factor Test.

6.3.9.10.5.1 Start tape reader.

6.3.9.10.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.3.9.10.6 Vertical Drift Test.

6.3.9.10.6.1 Start tape reader.

6.3.9.10.6.2 In approximately 67 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.3.9.10.7 Test Termination.

6.3.9.10.7.1 Start tape reader.

6.3.9.10.7.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.11 Test Position +00005.

6.3.9.11.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.11.1.1 Start tape reader.

6.3.9.11.1.2 When tape reader stops, verify DSKY Row 1 displays +00005.

6.3.9.11.2 Start tape reader.

6.3.9.11.2.1 When tape reader stops, wait 20 seconds.

6.3.9.11.3 Test Initialization.

6.3.9.11.3.1 Start tape reader.

6.3.9.11.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.11.4 **PIPA Scale Factor Test**

6.3.9.11.4.1 Start tape reader. Record time.

6.3.9.11.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM and GIMBAL LOCK lamps shall be lit.

6.3.9.11.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.3.9.11.5 Test Termination.

6.3.9.11.5.1 Start tape reader.

6.3.9.11.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.12 Test Position +00006.

6.3.9.12.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.12.1.1 Start tape reader.

6.3.9.12.1.2 When tape reader stops, verify DSKY Row 1 displays +00006.

6.3.9.12.2 Start tape reader.

6.3.9.12.2.1 When tape reader stops, wait 20 seconds.

6.3.9.12.3 Test Initialization.

6.3.9.12.3.1 Start tape reader.

6.3.9.12.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.12.4 PIPA Scale Factor Test.

6.3.9.12.4.1 Start tape reader. Record time.

6.3.9.12.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM and GIMBAL LOCK lamps shall be lit.

6.3.9.12.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.3.9.12.5 Test Termination.

6.3.9.12.5.1 Start tape reader.

6.3.9.12.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.13 Test Position +00007.

6.3.9.13.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.13.1.1 Start tape reader.

6.3.9.13.1.2 When tape reader stops verify DSKY Row 1 displays +00007.

6.3.9.13.2 Start tape reader.

6.3.9.13.2.1 When tape reader stops, wait 20 seconds.

6.3.9.13.3 Test Initialization.

6.3.9.13.3.1 Start tape reader.

6.3.9.13.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.13.4 Horizontal Drift Test.

6.3.9.13.4.1 Start tape reader.

6.3.9.13.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.13.4.3 In approximately 14 minutes, VERB 06 NOUN 96 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.3.9.13.5 Test Termination.

6.3.9.13.5.1 Start tape reader.

6.3.9.13.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.14 Test Position +00008.

6.3.9.14.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.14.1.1 Start tape reader.

6.3.9.14.1.2 When tape reader stops, verify DSKY Row 1 displays +00006.

6.3.9.14.2 Start tape reader.

6.3.9.14.2.1 When tape reader stops, wait 20 seconds.

6.3.9.14.3 Test Initialization.

6.3.9.14.3.1 Start tape reader.

6.3.9.14.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.14.4 Horizontal Drift Test

6.3.9.14.4.1 Start tape reader.

6.3.9.14.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish

6.3.9.14.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.14.5 Test Termination.

6.3.9.14.5.1 Start tape reader.

6.3.9.14.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.15 Test Position +00009.

6.3.9.15.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.15.1.1 Start tape reader.

6.3.9.15.1.2 When tape reader stops, verify DSKY Row 1 displays +00009.

6.3.9.15.2 Start tape reader.

6.3.9.15.2.1 When tape reader stops, wait 20 seconds.

6.3.9.15.3 Test Initialization.

6.3.9.15.3.1 Start tape reader.

6.3.9.15.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.15.4 Horizontal Drift Test.

6.3.9.15.4.1 Start tape reader.

6.3.9.15.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.15.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.15.5 Test Termination

6.3.9.15.5.1 Start tape reader.

6.3.9.15.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.16 Test Position +00010.

6.3.9.16.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.16.1.1 Start tape reader.

6.3.9.16.1.2 When tape reader stops, verify DSKY Row 1 displays +00010.

6.3.9.16.2 Start tape reader.

6.3.9.16.2.1 When tape reader stops, wait 20 seconds.

6.3.9.16.3 Test Initialization.

6.3.9.16.3.1 Start tape reader.

6.3.9.16.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.16.4 Horizontal Drift Test.

6.3.9.16.4.1 Start tape reader.

6.3.9.16.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.16.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.16.5 Test Termination.

6.3.9.16.5.1 Start tape reader.

6.3.9.16.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.17 Test Position +00011.

6.3.9.17.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.17.1.1 Start tape reader.

6.3.9.17.1.2 When tape reader stops, verify DSKY Row 1 displays +00011.

6.3.9.17.2 Start tape reader.

6.3.9.17.2.1 When tape reader stops, wait 20 seconds.

6.3.9.17.3 Test Initialization.

6.3.9.17.3.1 Start tape reader.

6.3.9.17.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.17.4 Horizontal Drift Test.

6.3.9.17.4.1 Start tape reader.

6.3.9.17.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.17.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.17.5 PIPA Scale Factor Test.

6.3.9.17.5.1 Start tape reader.

6.3.9.17.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.3.9.17.6 Test Termination.

6.3.9.17.6.1 Start tape reader.

6.3.9.17.6.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.18 Test Position +00012.

6.3.9.18.1 E-Memory Program and Test Position Matrix Sum Check

6.3.9.18.1.1 Start tape reader.

6.3.9.18.1.2 When tape reader stops, verify DSKY Row 1 displays +00012.

6.3.9.18.2 Start tape reader.

6.3.9.18.2.1 When tape reader stops, wait 20 seconds.

6.3.9.18.3 Test Initialization.

6.3.9.18.3.1 Start tape reader.

6.3.9.18.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

6.3.9.18.3.2 (continued) If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.18.4 Horizontal Drift Test.

6.3.9.18.4.1 Start tape reader.

6.3.9.18.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.18.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.18.5 PIPA Scale Factor Test.

6.3.9.18.5.1 Start tape reader.

6.3.9.18.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXX. and .XXXXX cm/sec/sec).

6.3.9.18.6 Test Termination.

6.3.9.18.6.1 Start tape reader.

6.3.9.18.6.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.19 Test Position +00013.

6.3.9.19.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.19.1.1 Start tape reader.

6.3.9.19.1.2 When tape reader stops, verify DSKY Row 1 displays +00013.

6.3.9.19.2 Start tape reader.

6.3.9.19.2.1 When tape reader stops, wait 20 seconds.

6.3.9.19.3 Test Initialization.

6.3.9.19.3.1 Start tape reader.

6.3.9.19.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.19.4 Horizontal Drift Test.

6.3.9.19.4.1 Start tape reader.

6.3.9.19.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.19.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXXX.XX meru).

6.3.9.19.5 Test Termination.

6.3.9.19.5.1 Start tape reader.

6.3.9.19.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.20 On CRT, record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.3.9.21 On K-148, enter the following sequence:

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

6.3.9.22 Calculations.

NOTE: Use Post Vibration or System Test data points only.

6.3.9.22.1 Y PIPA Data Correction Calculation.

6.3.9.22.1.1 From the uplink file tape, the compressed data tape or the PCM tape, request a data reduction of the X and Z accelerometer ΔV counts (addresses 37 and 41, respectively) and the TIME 2 and TIME 1 registers (addresses 24 and 25, respectively) for the period during which the Y PIPA test was being performed in Positions 5 and 6 of the IMU Performance Test.

6.3.9.22.1.2 Perform the following calculations for Position 5.

$$G'_5 = (G_5/\text{Cos } \theta y_5).$$

where:

G_5 = Measured acceleration term (line i)

G'_5 = Corrected acceleration term (corrected value for line i)

$\text{Cos } \theta y_5 = 1 - (\theta^2 y_5/2)$ for small angles

$$\theta y_5 = \sqrt{\theta^2{}_{x5} + \theta^2{}_{z5}}$$

and:

$$\theta_{z5} = (\Delta V_{x5} - \Delta V_x \text{ Bias})(\text{S.F.}_x)/(\Delta T)(\text{local g})$$

$$\theta_{x5} = (\Delta V_{z5} - \Delta V_z \text{ Bias})(\text{S.F.}_z)/(\Delta T)(\text{local g})$$

and:

$$\Delta V_x \text{ Bias} = (\text{X PIPA Bias})(\Delta T)/\text{S.F.}_x$$

$$\Delta V_z \text{ Bias} = (\text{Z PIPA Bias})(\Delta T)/\text{S.F.}_z$$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.3.9.22.1.3 Perform the following calculations for Position 6.

$$G'_6 = (G_6/\cos \theta y_6)$$

where:

G_6 = Measured acceleration term (line j)

G'_6 = Corrected acceleration term (corrected value for line j)

$\cos \theta y_6 = 1 - (\theta^2 y_6/2)$ for small angles

$$\theta y_6 = \sqrt{\theta^2_{x6} + \theta^2_{z6}}$$

and:

$$\theta_{z6} = (\Delta V_{x6} - \Delta V_x \text{ Bias}) (S.F._x) / (\Delta T) \text{ (local g)}$$

$$\theta_{x6} = (\Delta V_{z6} - \Delta V_z \text{ Bias}) (S.F._z) / (\Delta T) \text{ (local g)}$$

and:

$$\Delta V_x \text{ Bias} = (X \text{ PIPA Bias}) (\Delta T)/S.F._x$$

$$\Delta V_z \text{ Bias} = (Z \text{ PIPA Bias}) (\Delta T)/S.F._z$$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.3.9.22.2 Obtain data from last IRIG and/or PIPA Test and fill in Data Sheet x_{i-1}.

6.3.9.22.3 Obtain data from second last IRIG and/or PIPA Test and fill in Data Sheet x_{i-2}.

6.3.9.22.4 Obtain data from third last IRIG and/or PIPA Test and fill in Data Sheet x_{i-3}.

6.3.9.22.5 Perform the following calculations for each item appearing on Data Sheet x_i.

NOTE: See Paragraph 5.7 before continuing.

$$D_1 = \left| x_{i-1} - x_i \right|$$

$$D_2 = \left| x_{i-1} - x_i \right| + \left| x_{i-2} - x_{i-1} \right|$$

$$D_3 = \left| x_{i-3} - x_{i-2} \right| + \left| x_{i-2} - x_{i-1} \right| + \left| x_{i-1} - x_i \right|$$

DATA SHEET

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.3.9.7.4.3	+N BDY - ADOAY Position +00001	meru/g	( )___·__	a
6.3.9.8.4.3	+N BDZ - ADOAZ Position +00002	meru/g	( )___·__	b
6.3.9.8.5.2	-X PIPA Test Position +00002	cm/sec^2	( ) 0 0___· ( )_____	c
6.3.9.8.6.2	-N BDX + ADIAX Position +00002	meru/g	( )___·__	d
6.3.9.9.4.3	+N BDX - ADOAX Position +00003	meru/g	( )___·__	e
6.3.9.10.4.3	+N BDY + ADSRAY Position +00004	meru/g	( )___·__	f
6.3.9.10.5.2	-Z PIPA Test Position +00004	cm/sec^2	( ) 0 0___· ( )_____	g
6.3.9.10.6.2	+N BDZ + ADIAZ Position +00004	meru/g	( )___·__	h
6.3.9.11.4.3	+Y PIPA Test Position +00005	cm/sec^2	( ) 0 0___· ( )_____	i

DATA SHEET (continued)

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.3.9. 12.4.3	-Y PIPA Test Position +00006	cm/sec^2	( ) 0 0 ___ . ( ) _____	j
6.3.9. 13.4.3	-NBDX + .707 (ADSRAX - ADOAX) Position +00007	meru/g	( ) ___ . __	k
6.3.9. 14.4.3	-.707 (NBDZ+NBDY) +0.5 (ADIAZ-ADIAY) +0.5 (ADSRAY + ADSRAZ) Position +00008	meru/g	( ) ___ . __	l
6.3.9. 15.4.3	-NBDZ + .707 (ADSRAZ-ADOAZ) Position +00009	meru/g	( ) ___ . __	m
6.3.9. 16.4.3	.707 (NBDY-NBDX) +0.5 (ADIAY-ADIAX) +0.5 (ADSRAX) + 0.5 (ADOAY) Position +00010	meru/g	( ) ___ . __	n
6.3.9. 17.4.3	-NDBX - ADOAX Position +00011	meru/g	( ) ___ . __	o
6.3.9. 17.5.2	+Z PIPA Test Position +00011	cm/sec^2	( ) 0 0 ___ . ( ) _____	p
6.3.9. 18.4.3	+NBDY + ADOAY Position +00012	meru/g	( ) ___ . __	q
6.3.9. 18.5.2	+X PIPA Test Position +00012	cm/sec^2	( ) 0 0 ___ . ( ) _____	r
6.3.9. 19.4.3	+NBDZ + ADOAZ Position +00013	meru/g	( ) ___ . __	s

DATA SHEET

CALCULATION	PARAMETER	UNITS	
$\frac{\text{line a + line q}}{2}$ = ( )___.__ $\frac{\text{NBDY - ADOAY + NBDY + ADOAY}}{2}$ Transfer result to line ao	NBDY	meru	t
$\frac{\text{line q - line a}}{2}$ = ( )___.__ $\frac{\text{NBDY + ADOAY - (NBDY - ADOAY)}}{2}$	ADOAY	meru/g	u
$\frac{\text{line b + line s}}{2}$ = ( )___.__ $\frac{\text{NBDZ - ADOAZ + NBDZ + ADOAZ}}{2}$ Transfer result to line ap	NBDZ	meru	v
$\frac{\text{line s - line b}}{2}$ = ( )___.__ $\frac{\text{NBDZ + ADOAZ - (NBDZ - ADOAZ)}}{2}$	ADOAZ	meru/g	w
$\frac{\text{line e - line o}}{2}$ = ( )___.__ $\frac{\text{NBDX - ADOAX - (-NBDX - ADOAX)}}{2}$ Transfer result to line aq	NBDX	meru	x
$\frac{\text{line e + line o}}{2}$ x (-1) = ( )___.__ $\frac{\text{NBDX - ADOAX - NBDX - ADOAX}}{2}$ x (-1)	ADOAX	meru/g	y

DATA SHEET (continued)

CALCULATION	PARAMETER	UNITS	
line d + line x = ( )___ · __ (-NBDX + ADIAX) + NBDX Transfer result to line au	ADIAX	meru/g	z
line f - line t = ( )___ · __ (+NBDY + ADSRAY) - NBDY Transfer result to line ar	ADSRAY	meru/g	aa
line h - line v = ( )___ · __ (+NBDZ + ADIAZ) - NBDZ Transfer result to line av	ADIAZ	meru/g	ab
[line k + line x + .707 line y] x 1.414 [-NBDX + .707 ADSRAX -.707 ADOAX + NBDX + .707 ADOAX] x 1.414 Transfer results to line at	ADSRAX	meru/g	ac
(line m + line v + line w) x 1.414 [-NBDZ + .707(ADSRAZ-ADOAZ) + NBDZ + .707 ADOAZ] x 1.414 Transfer results to line as	ADSRAZ	meru/g	ad
(line n - .707 line t + .707 line x + 0.5 line z - 0.5 line ac - 0.5 line u) x 2 [.707(NBDY-NBDX) + 0.5(ADIAY-ADIAX) +0.5 ADSRAX + 0.5 ADOAY -.707 NBDY + .707 NBDX + 0.5 ADIAX -0.5 ADSRAX - 0.5 ADOAY] x 2 Transfer results to line aw.	ADIAY	meru/g	ae
line r - line c = ( )	PIPA X2G	cm/sec^2	af
line i - line j = ( )	PIPA Y2G	cm/sec^2	ag
line p - line g = ( )	PIPA Z2G	cm/sec^2	ah

DATA SHEET (continued)

CALCULATION	PARAMETER	UNITS	
1958.48 — line af x 1 cm/sec pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ax.	X PIPA S. F.	cm/sec/ pulse	ai
1958.48 — line ag x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ay.	Y PIPA S. F.	cm/sec/ pulse	aj
1958.48 — line ah x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer to line az.	Z PIPA S. F.	cm/sec pulse	ak
1/2 (line r + line c) = ( ) __ . ___ Transfer results to line ba.	X PIPA Bias	cm/sec^2	al
1/2 (line i + line j) = ( ) __ . ___ Transfer results to line bb.	Y PIPA Bias	cm/sec^2	am
1/2 (line p + line g) = ( ) __ . ___ Transfer results to line bc.	Z PIPA Bias	cm/sec^2	an

DATA SHEET (x_i)

PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
NBDY	meru	-15		+15			ao
NBDZ	meru	-15		+15			ap
NBDX	meru	-15		+15			aq
ADSRAY	meru/g	-40		+40			ar
ADSRAZ	meru/g	-40		+40			as
ADSRAX	meru/g	-40		+40			at
ADIAX	meru/g	-100		+100			au
ADIAZ	meru/g	-100		+100			av
ADIAY	meru/g	-100		+100			aw
X PIPA S.F. error from line ai	PPM	-1900		+1900			ax
Y PIPA S.F. error from line aj	PPM	-1900		+1900			ay
Z PIPA S.F. error from line ak	PPM	-1900		+1900			az
X PIPA Bias from line al	cm/sec^2	-3.1		+3.1			ba
Y PIPA Bias from line am	cm/sec^2	-3.1		+3.1			bb
Z PIPA Bias from line an	cm/sec^2	-3.1		+3.1			bc

DATA SHEET (x_{1-1})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET (x_1-2)

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S.F. error	PPM	
Y PIPA S.F. error	PPM	
Z PIPA S.F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET (x_{1-3})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S.F. error	PPM	
Y PIPA S.F. error	PPM	
Z PIPA S.F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET

PARAMETER	UNITS	D_1	MAX	D_2	MAX	D_3	MAX
NBDY	meru		6.0		9.0		11.0
NBDZ	meru		6.0		9.0		11.0
NBDX	meru		6.0		9.0		11.0
ADSRAY	meru/g		14.0		21.0		25.0
ADSRAZ	meru/g		14.0		21.0		25.0
ADSRAX	meru/g		14.0		21.0		25.0
ADIAX	meru/g		17.0		33.0		40.0
ADIAZ	meru/g		17.0		33.0		40.0
ADIAY	meru/g		17.0		33.0		40.0
X PIPA S. F. error	PPM		400		500		600
Y PIPA S. F. error	PPM		400		500		600
Z PIPA S. F. error	PPM		400		500		600
X PIPA Bias	cm/sec^2		0.50		0.70		0.90
Y PIPA Bias	cm/sec^2		0.50		0.70		0.90
Z PIPA Bias	cm/sec^2		0.50		0.70		0.90

6.3.10 LGC Voltage Margin Test

6.3.10.1 Initial Conditions.

6.3.10.1.1 Insure that the G&N System is in the Standby Mode.

6.3.10.1.2 On the CRT, verify the +28 VDC LGC OPERATE bus is between 24.5 and 33.5 vdc (GG 1520).

6.3.10.1.3 On Panel 5, set lighting override ANUN SW to OFF. Rotate the ANUN/NUM dimmer fully CCW.

6.3.10.2 Voltage Margin Determination

6.3.10.2.1 On the PSA Adapter Module (PSAAM) (410-31080), place INHIBIT VOLTAGE FAIL switch to ON.

CAUTION: The +4 vdc LGC supply voltage shall never be operated lower than +2.5 vdc or higher than +5.2 vdc (GG 1030.)

The +14 vdc LGC supply shall never be operated less than +8.5 vdc or higher than +17.0 vdc (GG 1020). LTG-ANUN/NUM control on Panel 5 shall be set to DIM during the performance of the Voltage Margin Test in order to avoid decreasing the operating life of the DSKY EL lamps.

NOTE: The flashing indication of the LGC supplies may be disregarded for this test.

6.3.10.2.2 Enter 0001 into R-155. Verify and execute. Enter 1100 into R-153. Verify and execute.

6.3.10.2.3 Enter 1111 into R-154. Verify and execute.

6.3.10.2.4 Enter in C-156±XX.X001114. (Enter a value for XX.X which will adjust the +14V power supply (GG 1020) as monitored on the CRT to 12.1 (+0.1, -0) vdc). Execute.

6.3.10.2.5 Enter in C-156±XX.X001124 (Enter a value for XX.X which will adjust the +4V power supply (GG 1030) as monitored on the CRT, to 3.4(+0.03, -0.00) vdc). Execute.

6.3.10.2.6 On K-148, enter the following:

VERB 36 ENTR Wait 10 seconds.

6.3.10.2.7 Verify K-START tape F10L004-K10538-XX LM Self-Check Test is on the K-START tape reader, where XX equals tape revision number.

6.3.10.2.7.1 Start tape reader.

6.3.10.2.7.2 When tape reader stops, verify:

R1 = +16XXX
R2 = +10538 (tape number)
R3 = -000XX (tape revision number)

6.3.10.2.8 Load E-Memory Program.

6.3.10.2.8.1 Start tape reader.

6.3.10.2.8.2 When tape reader stops, verify:

R1 = 00101.

6.3.10.2.9 Initiate Self-Check.

6.3.10.2.9.1 Start tape reader.

6.3.10.2.9.2 Wait until R2 = 00002. Verify RESTART lamp on DSKY is not lit.

6.3.10.2.10 Into R-154, insert 0011. Verify and execute.

6.3.10.2.11 In the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lit.

6.3.10.2.12 On the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to ON. Into R-154, insert 1111. Verify and execute. Press ERROR RESET.

6.3.10.2.13 Enter in C-156 (±) XX.X001114 (Enter a value for XX.X which will adjust the +14V power supply (GG 1020) as monitored on the CRT, to 16.4 (+0.1, -0.0) vdc). Execute.

6.3.10.2.14 Initiate Self-Check.

6.3.10.2.14.1 Return K-START tape to its previous stop.

6.3.10.2.14.2 Start tape reader.

6.3.10.2.14.3 Wait until R2 = 00002. Verify RESTART lamp on DSKY is not lit.

6.3.10.2.15 Into R-154, insert 1100. Verify and execute.

6.3.10.2.16 On the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lit. Set the INHIBIT VOLTAGE FAIL switch to ON. Into R-154, insert 1111. Verify and execute. Press ERROR RESET.

6.3.10.2.17 Enter in C-156±XX.X001124 (Enter a value for XX.X which will adjust the +4V power supply (GG 1030) as monitored on the CRT, to 4.6 (+0.03, -0.0) vdc). Execute.

6.3.10.2.18 Initiate Self-Check.

6.3.10.2.18.1 Return K-START tape to its previous stop.

6.3.10.2.18.2 Start tape reader.

6.3.10.2.18.3 Wait until R2 = 00002. Verify RESTART lamp on DSKY is not lit.

6.3.10.2.19 Into R-154, insert 0011. Verify and execute.

6.3.10.2.20 On the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lit. Set the INHIBIT VOLTAGE FAIL switch to ON. Into R-154, insert 1111. Verify and execute. Press ERROR RESET.

6.3.10.2.21 Enter in C-156 (±) XX.X001114 (Enter a value for XX.X which will adjust the 14V power supply (GG 1020) as monitored on the CRT, to 12.1 (+0.1, -0) vdc). Execute.

6.3.10.2.22 Initiate Self-Check.

6.3.10.2.22.1 Return K-START tape to its previous stop.

6.3.10.2.22.2 Start tape reader.

6.3.10.2.22.3 Wait until R2 = 00002. Verify RESTART lamp on the DSKY is not lit.

6.3.10.2.23 Into R-154, insert 1100. Verify and execute.

6.3.10.2.24 On the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lit.

6.3.10.2.25 On R-154, enter 0000. Execute.

6.3.10.2.26 On R-155, enter 0000. Execute.

6.3.10.2.27 On K-148, press ERROR RESET.

6.3.10.2.28 Remove tape from K-START tape reader.

6.3.11 LGC Clock Frequency Test

6.3.11.1 Insure that LGC Operate power has been applied for a minimum of 10 minutes.

6.3.11.2 Verify that the counter is connected to the 3.2 kc signal on the hardline.

6.3.11.3 Obtain a 30 second sample of clock frequency.

6.3.11.4 Repeat 6.3.11.3 nine times.

6.3.11.5 The average of the 10 previous readings shall be 30.000000±0.000060 seconds.

6.3.11.6 Insure that the System is not in IMU Operate.

6.3.11.7 Enter the following on K-148:

VERB 37 ENTR
06 ENTR
VERB 50 NOUN 25 shall flash
Row 1 = 00062

Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the STBY lamp is lit.

6.3.11.8 Repeat steps 6.3.11.3 and 6.3.11.4.

6.3.11.9 Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the STBY lamp is not lit. Restart lamp may be on. VERB 37 shall flash on the DSKY. Enter VERB 36 ENTR on DSKY. Wait 10 seconds.

6.3.11.10 MARK X Pushbutton Test.

6.3.11.10.1 On the Computer Control and Reticle Dimmer assembly, press and hold MARK X pushbutton.

6.3.11.10.2 On K-148 enter the following:

VERB 05 NOUN 09 ENTR

On the DSKY observe:

Row 1 = 00112
PROG alarm lamp is lit

Press ERR RSET.

6.3.11.10.3 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.10.4 Observe that DSKY Row 1 displays 00004.

6.3.11.10.5 Release MARK X pushbutton.

6.3.11.10.6 Observe that DSKY Row 1 displays 00000.

6.3.11.11 MARK Y Pushbutton Test

6.3.11.11.1 Press and hold the MARK Y Pushbutton on the Computer Control and Reticle Dimmer Assembly.

6.3.11.11.2 On K-148 enter the following:

VERB 05 NOUN 09 ENTR

On the DSKY observe:

Row 1 = 00112
PROG alarm lamp is lit

Press ERR RSET.

6.3.11.11.3 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.11.4 Observe that DSKY Row 1 displays 00010.

6.3.11.11.5 Release the MARK Y pushbutton.

6.3.11.11.6 Observe that DSKY Row 1 displays 00000.

6.3.11.12 REJECT Pushbutton Test

6.3.11.12.1 Press and hold the REJECT pushbutton on the Computer Control and Reticle Dimmer assembly.

6.3.11.12.2 On CRT verify FAILREG = 00112

PROG alarm lamp is lit

Press ERR RSET.

6.3.11.12.3 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.12.4 Observe that DSKY Row 1 displays 00020.

6.3.11.12.5 Release the REJECT pushbutton.

6.3.11.12.6 Observe that DSKY Row 1 displays 00000.

6.3.11.13 Reticle Brightness Control Test

6.3.11.13.1 On the DSKY perform the following operation:

VERB 36 ENTR

6.3.11.13.2 On panel 11 close PGNS AOT lamp circuit breaker. On the Computer Control and Reticle Dimmer assembly, rotate the RETICLE BRIGHTNESS control to its minimum light intensity position. View through the AOT and verify that the Reticle lamp is off.

6.3.11.13.3 While viewing through the AOT, slowly rotate the RETICLE BRIGHTNESS control to increase the reticle brightness until a stop is reached. Observe that the reticle brightness has increased in intensity. Return RETICLE BRIGHTNESS control to off state. On panel 11 open PGNS AOT lamp circuit breaker.

6.3.11.14 AOT Eyepiece Heater Test.

6.3.11.14.1 Secure milliammeter HP 428B and current probe HP 428A-21A.

6.3.11.14.2 Locate P1 at Computer Control and Reticle Dimmer assembly. Push lacing cord away from P1 back to fifth tie point.

6.3.11.14.3 Clip current probe HP 428A-21A to blue wire in cable with red arrow pointing away from P1. Measure and record current indication. The current shall be between 139 and 244 ma.

6.3.11.14.4 Remove current probe, push lacing cord back to P1 and spot tie.

6.3.12 Gimbal Friction Test

6.3.12.1 Inner Gimbal Friction Test.

6.3.12.1.1 On K-148 enter the following sequence:

```
VERB 41 NOUN 20 ENTR
+00000          ENTR
+00000          ENTR
+00000          ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000          ENTR
+17000          ENTR
+17000          ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000          ENTR
+27000          ENTR
+27000          ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000          ENTR
+00000          ENTR
+00000          ENTR
```

6.3.12.1.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00150).

6.3.12.1.3 Set up Analog Recorder to monitor the following signals.

Meas. No.	Signal Name
a. GG 2110	IG Torque Motor Current
b. GG 2106	IG Servo Error Total
c. GG 2107	IG Servo Error In Phase
d. GG 2112	IG 1X Resolver Sine
e. GG 2113	IG 1X Resolver Cosine
f. GG 2220	IG CDU Fine Error
g. GG 1201	IMU 28V 1% 800 CPS
h. GG 2221	IG CDU Coarse Error

6.3.12.1.4 Set up Analog Recorder to monitor the following signals:

Meas. No.	Signal Name
GG 2300	PIPA TEMP
[illegible]	[illegible]
GG 1520	+28 VDC LGC OPR BUS

6.3.12.1.5 After 10 seconds has elapsed since Step 6.3.12.1.1, enter the following into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR (OGC)
00000 ENTR

6.3.12.1.6 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.1.7 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
37777 ENTR ENTR
37743 ENTR ENTR
00000 ENTR ENTR
00000 ENTR (once)

6.3.12.1.8 IG -360° TORQUE

6.3.12.1.9 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.1.10 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.1.11 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTER Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR

6.3.12.1.11 (Continued)

+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.1.12 On the CRT, verify CDU X, CDU Y, CDU Z all indicate +00000 (±00150).

6.3.12.1.13 After 10 seconds has elapsed since Step 6.3.12.1.11, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.1.14 Verify on CRT, DSKY display.

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.1.15 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
40000 ENTR ENTR
40034 ENTR ENTR
00000 ENTR ENTR
00000 ENTR (once)
40034 ENTR ENTR
Verify R1 = 40034
00000 ENTR ENTR
Verify R1 = 00000
00000 ENTR (once)
Verify R1 = 00000

6.3.12.1.16 IG +360° TORQUE

6.3.12.1.17 On K-148 enter the following sequence

VERB 42 ENTR
VERB 33 ENTR

6.3.12.1.18 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.2 Outer Gimbal Friction Test

6.3.12.2.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.2.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00150).

6.3.12.2.3 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2167	OG Servo Error In Phase
b. GG 2170	OG Torque Motor Current
c. GG 2166	OG Servo Error Total
d. GG 2280	OG CDU Fine Error
e. GG 2172	OG 1X Resolver Sine
f. GG 2173	OG 1X Resolver Cosine
g. GG 2281	OG CDU Coarse Error

6.3.12.2.4 After 10 seconds has elapsed since Step 6.3.12.2.1, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
37777 ENTR

6.3.12.2.5 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 = 37777
R3 = 02737

6.3.12.2.6 On K-148, enter the following sequence:

NOUN 15 ENTR
37743 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR (once)

6.3.12.2.7 OG -360° TORQUE

6.3.12.2.8 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.2.9 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.2.10 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTER, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.2.11 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00150).

6.3.12.2.12 After 10 seconds has elapsed since Step 6.3.12.2.10, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
40000 ENTR

6.3.12.2.13 Verify on CRT, DSKY display:

VERB 21 NOUN 01
R1 = 40000
R3 = 02737

6.3.12.2.14 On K-148 enter the following sequence:

NOUN 15 ENTR
40034 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR

6.3.12.2.15 OG +360° TORQUE

6.3.12.2.16 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.2.17 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.3 Middle Gimbal Friction Test.

6.3.12.3.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds

6.3.12.3.1 (Continued)

VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+06750 ENTR

6.3.12.3.2 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00150, and CDU Z = +06750±00200.

6.3.12.3.3 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2136	MG Servo Error Total
b. GG 2137	MG Servo Error In Phase
c. GG 2140	MG Torque Motor Current
d. GG 2143	MG 1X Resolver Cosine
e. GG 2250	MG CDU Fine Error
f. GG 2142	MG 1X Resolver Sine
g. GG 2251	MG CDU Coarse Error

6.3.12.3.4 After 10 seconds have elapsed since Step 6.3.12.3.1, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.3.5 Verify on CRT, DSKY display:

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.3.6 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
14000 ENTR ENTR
00000 ENTR (once)

6.3.12.3.7 MG -135° TORQUE

6.3.12.3.8 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.3.9 Monitor analog recorder. When MG Torque Motor Current (GG 2140) drops to a quiescent level (approximately 6 minutes), stop the recorders.

6.3.12.3.10 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
-06750 ENTR

6.3.12.3.11 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00150, and CDU Z = -06750±00200.

6.3.12.3.12 After 10 seconds has elapsed since Step 6.3.12.3.10, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.3.13 On the CRT, verify DSKY display:

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.3.14 On K-148 enter the following sequence:

NOUN 15	ENTR
00000	ENTR ENTR
00000	ENTR ENTR
00000	ENTR ENTR
63777	ENTR ENTR
77777	ENTR (once)

6.3.12.3.15 MG +135° TORQUE

6.3.12.3.16 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.3.17 Monitor analog recorder. When the MG Torque Motor Current signal (GG 2140) drops to a quiescent level (approximately 6 minutes) stop the recorders.

6.3.12.3.18 On K-148 enter the following sequence:

VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR
Wait 15 seconds	
VERB 36	ENTR

6.3.12.4 Test Analysis.

6.3.12.4.1 Remove the strip charts from analog recorders.

6.3.12.4.2 Examine the traces of the recorded measurements for all six phases of this test to detect any sharp discontinuities. Disregard transients of 0.5 second duration or less on the Gimbal Torque Motor current traces and disregard all transients on the CDU Fine Error and CDU Coarse Error traces. The Gimbal Torque Motor currents shall not exceed 0.125 ampere. The CDU Fine Error measurements shall not exceed ± 70 mv rms. The CDU Coarse Error measurement shall not exceed ± 680 mv rms.

6.3.13 Stabilization Loop Step Response Test

6.3.13.1 IG Response Test

6.3.13.1.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.13.1.2 On CRT, verify IG MG, and OG gimbal angles are between 358 and 002.

6.3.13.1.3 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2106	IG Servo Error Total
b. GG 2107	IG Servo Error In Phase
c. GG 2110	IG Torque Motor Current
d. GG 2112	IG 1X Resolver Sine
e. GG 2113	IG 1X Resolver Cosine
f. GG 2220	IG CDU Fine Error
g. GG 1201	IMU 28V 1 PCT 800 CPS

6.3.13.1.4 On K-148 enter the following:

VERB 40 NOUN 20 ENTR, Wait 10 seconds

6.3.13.1.5 On the CRT verify CDU X, CDU Y AND CDU Z indicate +00000±00200.

CAUTION: If the transients caused by the subsequent step input do not settle within 15 seconds, remove IMU Operate Power.

6.3.13.1.6 Enter 1000 into R-155.

6.3.13.1.7 Press XEQ/SEAL pushbutton on R-155 to enter the DC step voltage into the IG stabilization loop.

6.3.13.1.8 Prepare to start analog recorder.

6.3.13.1.9 Enter 0000 into R-155. Start analog recorder. Press the XEQ/SEAL pushbutton to remove the step input to the IG stabilization loop.

6.3.13.1.10 After the transient on the recorder has settled, stop this recorder.

6.3.13.1.11 From the Servo Error In Phase signal recorder trace measure the time interval (T1, Fig. 2) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 2). The period T1, shall not exceed 0.1 second and the trace shall have no more than 3 overshoots.

6.3.13.2 MG Response Test

6.3.13.2.1 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2136	MG Servo Error Total
b. GG 2137	MG Servo Error In Phase
c. GG 2140	MG Torque Motor Current
d. GG 2142	MG 1X Resolver Sine
e. GG 2143	MG 1X Resolver Cosine
f. GG 2250	MG CDU Fine Error
g. GG 1201	IMU 28V 1% 800 cps

6.3.13.2.2 On the CRT, verify CDU X, CDU Y and CDU Z indicate +00000 (±00200).

CAUTION: If the transients caused by the subsequent step input do not settle within 15 seconds, remove IMU Operate Power.

6.3.13.2.3 Enter 0100 into R-155. Press XEQ/SEAL pushbutton R-155 to enter the DC step voltage into the MG stabilization loop.

6.3.13.2.4 Prepare to start analog recorder.

6.3.13.2.5 Enter 0000 into R-155. Start analog recorder. Press XEQ/SEAL pushbutton to remove the step input to the MG stabilization loop.

6.3.13.2.6 After the transient on the recorder has settled, stop the recorder.

6.3.13.2.7 From the Servo Error In Phase signal recorder trace measure the time interval (T1 Fig. 2) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 2). The period T1, shall not exceed 0.1 seconds and the trace shall have no more than 3 overshoots.

6.3.13.3 OG Response Test

6.3.13.3.1 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2166	OG Servo Error Total
b. GG 2167	OG Servo Error In Phase
c. GG 2170	OG Torque Motor Current

6.3.13.3.1 (Continued)

	Meas. No.	Signal Name
d.	GG 2172	OG 1X Resolver Sine
e.	GG 2173	OG 1X Resolver Cosine
f.	GG 2280	OG CDU Fine Error
g.	GG 1201	IMU 28V 1% 800 cps

6.3.13.3.2 On the CRT, verify CDU X, CDU Y and CDU Z indicate +00000 (±00200).

CAUTION: If the transients caused by the subsequent step input do not settle within 15 seconds, remove IMU Operate Power.

6.3.13.3.3 Enter 0010 into R-155. Press XEQ/SEAL pushbutton on R-155 to enter the DC step voltage into the OG stabilization loop.

6.3.13.3.4 Prepare to start analog recorder.

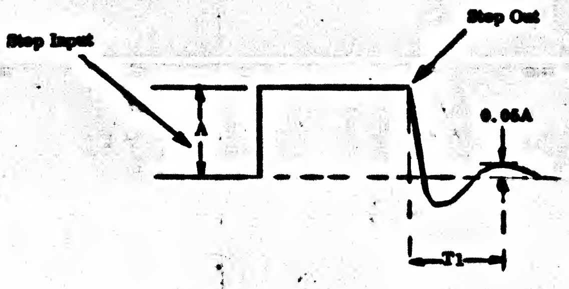
6.3.13.3.5 Enter 0000 into R-155. Start analog recorder. Press XEQ/SEAL pushbutton to remove the step input to the OG stabilization loop.

6.3.13.3.6 After the transient on the recorder has settled, stop the recorder.

6.3.13.3.7 From the Servo Error In Phase signal recorder trace, measure the time interval (T1, Fig. 2) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 2). The period, T1, shall not exceed 0.1 second and the trace shall have not more than 5 overshoots.

6.3.13.3.8 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR



TYPICAL STAB LOOP RESPONSE TO STEP INPUT

FIGURE 2

6.3.14 G&N Fine Alignment Test (see Table III in section 5).

6.3.15 AOT Functional Accuracy Test

NOTE: Use of a Dioptometer is required when sighting through AOT. The included angles between target LOS shall be known to ±10 arc-seconds. The elevation of each target LOS shall be known to ±15 arc-seconds.

6.3.15.1 Place the AOT in F detent position.

6.3.15.2 While viewing through the AOT instruct target F operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target F until the center of the target reticle appears in the center of the AOT reticle.

6.3.15.3 Level the Theodolite base while assuring that the center of the target reticle remains in the center of the AOT reticle.

6.3.15.4 When it has been assured that the Theodolite is level and the target reticle appears in the center of the AOT reticle, zero the F Theodolite azimuth dial.

6.3.15.5 Place the AOT in the L detent position.

6.3.15.6 While viewing through AOT instruct the target L operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target L until the target reticle appears in the lower right quadrant of the AOT field of view.

6.3.15.7 Level the Theodolite base while assuring that the target reticle remains visible in the lower right quadrant of the AOT field of view.

6.3.15.8 When it has been assured that the Theodolite is level and the target reticle is visible, zero the L Theodolite azimuth dial.

6.3.15.9 Place the AOT in the R detent position.

6.3.15.10 While viewing through the AOT instruct the R operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target R until the target reticle appears in the lower left quadrant of the AOT field of view.

6.3.15.11 Level the Theodolite base while assuring that the target reticle remains visible in the lower left quadrant of the AOT field of view.

6.3.15.12 When it has been assured that the Theodolite is level and the target reticle is visible, zero the R Theodolite azimuth dial.

6.3.15.13 Verify that target Theodolite L, F and R bases are level. Place the AOT in each detent position from left to right and verify that each target reticle is still visible and in the proper field of view. If adjustments are required insure that the azimuth dial is rezeroed. Repeat this target scanning process until the AOT operator is satisfied with target placement.

6.3.15.14 AOT Measurement of X_1 (L-F)

6.3.15.15 Set AOT in L detent position.

6.3.15.16 Rotate the AOT control knob until the center of the target reticle is superimposed between the double Y reticle. Read and record as LY = XXX.XX.

6.3.15.17 Rotate the AOT control knob until the center of the target reticle is superimposed between the double SPIRAL lines of AOT reticle. Record AOT dial indication as LS = XXX.XX.

6.3.15.18 Record target L Theodolite elevation angle from horizontal as $\phi 1$.

6.3.15.19 Set AOT in F detent position.

6.3.15.20 Rotate AOT control knob until the center of the target reticle is superimposed between the double Y reticle. Record AOT dial indication as FY = XXX.XX.

6.3.15.21 Rotate the AOT control knob until the center of the target reticle is superimposed between the double S reticle lines. Record AOT dial indication as FS = XXX.XX.

6.3.15.22 Record target F Theodolite elevation angle from horizontal as ϕ_2.

6.3.15.23 AOT Measurement of X_2 (L - R).

6.3.15.24 Set AOT in R detent position.

6.3.15.25 Rotate AOT control knob until the center of the target reticle is superimposed between the double Y reticle. Record AOT dial indication as RY = XXX.XX.

6.3.15.26 Rotate AOT control knob until the center of the target reticle is superimposed between the double SPIRAL reticle lines. Record AOT dial indication as RS = XXX.XX.

6.3.15.27 Record target R Theodolite elevation angle from horizontal ϕ_3.

6.3.15.28 Theodolite measurement of X_1' and X_2'.

6.3.15.28.1 Collimate Theodolite L and F. Read azimuth angle indicated by L Theodolite. Subtract angle from 360.00 deg and record as α_1. Read and record the azimuth angle indicated by F Theodolite as α_2.

6.3.15.28.2 Collimate Theodolite L and R. Read azimuth angle indicated by R Theodolite and record as α_3. Read and record the azimuth angle indicated by L Theodolite. Subtract angle from 360.00 deg and record as α'_1.

6.3.15.28.3 Calculate the values of the included angles between target L and F as X'_1 and targets L and R as X'_2.

$$X'_1 = \cos^{-1}\left\{\sin\phi_1 \sin\phi_2 + \cos\phi_1 \cos\phi_2 \cos\left[180 - (\alpha_1 + \alpha_2)\right]\right\}$$

$$X'_2 = \cos^{-1}\left\{\sin\phi_1 \sin\phi_3 + \cos\phi_1 \cos\phi_3 \cos\left[180 - (\alpha_3 + \alpha'_1)\right]\right\}$$

6.3.15.29 Perform the following calculations:

$$\sigma_L = \frac{360^\circ + \theta_L - \phi_L}{12}$$

$$\sigma_F = \frac{360^\circ + \theta_F - \phi_F}{12}$$

$$\sigma_R = \frac{360^\circ + \theta_R - \phi_R}{12}$$

where:

θ_L = LS and ϕ_L = LY

θ_F = FS and ϕ_F = FY

θ_R = RS and ϕ_R = RY

6.3.15.30 Obtain the AOT Detent Calibration Data and record as follows:

E_L = L Elevation Calibration Data
E_F = F Elevation Calibration Data
E_R = R Elevation Calibration Data

D_L = L Azimuth Calibration Data
D_F = F Azimuth Calibration Data
D_R = R Azimuth Calibration Data

6.3.15.31 Perform the following calculations to determine the Left detent target vector in the Nav Base Coordinate System:

$$\begin{bmatrix} S_{XL} \\ S_{YL} \\ S_{ZL} \end{bmatrix}_{NB} = \begin{bmatrix} \cos E_L \sin \sigma_L \cos (\phi_L - D_L) + \sin E_L \cos \sigma_L \\ -\sin E_L \sin \sigma_L \sin D_L \cos (\phi_L - D_L) + \sin \sigma_L \cos D_L \sin (\phi_L - D_L) + \cos E_L \cos \sigma_L \sin D_L \\ -\sin E_L \sin \sigma_L \cos D_L \cos (\phi_L - D_L) - \sin \sigma_L \sin D_L \sin (\phi_L - D_L) + \cos E_L \cos \sigma_L \cos D_L \end{bmatrix}$$

6.3.15.32 Perform the following calculations to determine the Forward detent target vector in the Nav Base Coordinate System:

$$\begin{bmatrix} S_{XF} \\ S_{YF} \\ S_{ZF} \end{bmatrix}_{NB} = \begin{bmatrix} \cos E_F \sin \sigma_F \cos (\phi_F - D_F) + \sin E_F \cos \sigma_F \\ -\sin E_F \sin \sigma_F \sin D_F \cos (\phi_F - D_F) + \sin \sigma_F \cos D_F \sin (\phi_F - D_F) + \cos E_F \cos \sigma_F \sin D_F \\ -\sin E_F \sin \sigma_F \cos D_F \cos (\phi_F - D_F) - \sin \sigma_F \sin D_F \sin (\phi_F - D_F) + \cos E_F \cos \sigma_F \cos D_F \end{bmatrix}$$

6.3.15.33 Perform the following calculations to determine the Right Detent target vector in the Nav Base Coordinate System:

$$\begin{bmatrix} S_{XR} \\ S_{YR} \\ S_{ZR} \end{bmatrix}_{NB} = \begin{bmatrix} \cos E_R \sin \sigma_R \cos (\phi_R - D_R) + \sin E_R \cos \sigma_R \\ -\sin E_R \sin \sigma_R \sin D_R \cos (\phi_R - D_R) + \sin \sigma_R \cos D_R \sin (\phi_R - D_R) + \cos E_R \cos \sigma_R \sin D_R \\ -\sin E_R \sin \sigma_R \cos D_R \cos (\phi_R - D_R) - \sin \sigma_R \sin D_R \sin (\phi_R - D_R) + \cos E_R \cos \sigma_R \cos D_R \end{bmatrix}$$

6.3.15.34 Calculate AOT measurement of X_1' as follows:

$$X_1' = \cos^{-1} \frac{S_{XL} S_{XF} + S_{YL} S_{YF} + S_{ZL} S_{ZF}}{\sqrt{S_{XL}^2 + S_{YL}^2 + S_{ZL}^2} \times \sqrt{S_{XF}^2 + S_{YF}^2 + S_{ZF}^2}}$$

Verify $X_1 = X_1' \pm 0.08$ degrees.

6.3.15.35 Calculate AOT measurement of X_2' as follows:

$$X_2' = \cos^{-1} \frac{S_{XL} S_{XR} + S_{YL} S_{YR} + S_{ZL} S_{ZR}}{\sqrt{S_{XL}^2 + S_{YL}^2 + S_{ZL}^2} \times \sqrt{S_{XR}^2 + S_{YR}^2 + S_{ZR}^2}}$$

Verify $X_2 = X_2' \pm 0.08$ degrees.

6.3.16 Flight Rope Fixed Memory Bank Sum Check

NOTE: Before proceeding with this test, obtain a Computer Program listing of the flight program being tested. Prepare a list of the bank CKSM bugger words.

6.3.16.1 Verify G&N System in Standby Mode.

6.3.16.2 On K-148 enter the following sequence:

Press ERR RSET
VERB 56 ENTR
Observe VERB 05 NOUN 01 flashing

6.3.16.3 Record the CRT DSKY display indications.

Row 1 = AAAAA	Bank Sum
Row 2 = 000BB	Bank Number
Row 3 = CCCCC	(Bank CKSM bugger word)

Row 1 shall be the same as or the complement of the number displayed in Row 2. Row 3 indication shall be the same as the bugger word recorded above for the bank tested.

6.3.16.4 On K-148 enter VERB 33 ENTR

6.3.16.5 Repeat paragraphs 6.3.16.3 and 6.3.16.4 until all memory bank sums have been checked.

6.3.16.6 On K-148 enter VERB 34 ENTR.

6.3.17 RR/CDU Control Test

NOTE: RR CDU testing requires that the Rendezvous Radar is operating. The Rendezvous Radar is not activated until Integrated testing. To insure that the RR CDU's are operating properly the minimum requirements for RR CDU testing are presented here so that they may be included as part of the requirements to be demonstrated at the first opportunity after Rendezvous Radar activation.

6.3.17.1 Initialization

6.3.17.1.1 On K-148 enter the following:

VERB 36	ENTR, Wait 10 seconds
VERB 41 NOUN 72	ENTR
+04500	ENTR
+04500	ENTR
Wait 10 seconds	
VERB 41 NOUN 72	ENTR
+00000	ENTR
+00000	ENTR

VERB 04 NOUN 06 shall flash.
Verify Row 2 = 00002

If Row 2 display is correct proceed to next step. If it is not correct, enter the following on K-148:

VERB 22	ENTR
00002	ENTR

6.3.17.1.2 On K-148 enter the following:

VERB 33	ENTR

Wait 25 seconds before continuing.

6.3.17.2 CDU Fine and CDU Coarse Error

6.3.17.2.1 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 3311	Shaft CDU Fine Error
b. GG 3312	Shaft CDU Coarse Error
c. GG 3321	Trunnion CDU Fine Error
d. GG 3322	Trunnion CDU Coarse Error

6.3.17.2.2 On K-148 enter the following:

VERB 36 ENTR, Wait 10 seconds
VERB 41 NOUN 72 ENTR
+04500 ENTR
+04500 ENTR
VERB 04 NOUN 06 shall flash.
Verify Row 2 = 00002
VERB 33 ENTR

Wait 10 seconds. Verify on CRT that RR CDU Trunnion and Shaft angles indicate 045.00±000.30 deg.

6.3.17.2.3 Verify the following signals on the CRT:

RR Shaft 1X Sine (GG 3304)	18.4±1.84 VRMS
RR Shaft 1X Cos (GG 3305)	18.4±1.84 VRMS
RR Trunnion 1X Sine (GG 3324)	18.4±1.84 VRMS
RR Trunnion 1X Cos (GG 3325)	18.4±1.84 VRMS

6.3.17.2.4 Verify CDU Fine Errors (GG 3311, GG 3321) do not exceed 0.07 volts.

6.3.17.2.5 Verify CDU Coarse Errors (GG 3312, GG 3322) do not exceed 0.680 volts.

6.3.17.3 RR CDU Fail.

6.3.17.3.1 On K-148 enter the following:

VERB 36 ENTR, Wait 10 seconds
VERB 41 NOUN 72 ENTR
+00100 ENTR
+00000 ENTR
VERB 04 NOUN 06 shall flash
Verify Row 2 = 00002
VERB 33 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00001 ENTR

Verify RR CDU Fail and Tracker Alarm come ON in approximately 10 seconds.

6.3.17.3.2 Press ERR RSET
VERB 36 ENTR, Wait 10 seconds
VERB 41 NOUN 72 ENTR
+00000 ENTR
+00000 ENTR
VERB 44 ENTR

6.3.17.3.2 (Continued)

+00100 ENTR
VERB 04 NOUN 06 shall flash
Verify Row 2 = 00002
VERB 33 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00001 ENTR

Verify RR CDU Fail and Tracker Alarm come ON in approximately 10 seconds.

6.3.17.3.3 On K-148 enter the following:

Press ERR RSET
VERB 36 ENTR, Wait 10 seconds
VERB 41 NOUN 72 ENTR
+03375 ENTR
+00000 ENTR
VERB 04 NOUN 06 shall flash
Verify Row 2 = 00002
VERB 33 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00001 ENTR

Verify RR CDU Fail and Tracker Alarm come ON in approximately 10 seconds.

6.3.17.3.4 On K-148 enter the following:

Press ERR RSET
VERB 36 ENTR, Wait 10 seconds
VERB 41 NOUN 72 ENTR
+00000 ENTR
+03375 ENTR
VERB 04 NOUN 06 shall flash
Verify Row 2 = 00002
VERB 33 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00001 ENTR

Verify RR CDU Fail and Tracker Alarm come ON in approximately 10 seconds.

6.3.17.3.5 On K-148 enter the following:

Press ERR RSET
VERB 44 ENTR
VERB 41 NOUN 72 ENTR
+00000 ENTR
+00000 ENTR
VERB 44 ENTR

APPENDIX I

MEASUREMENT TOLERANCES

Signal	Link	Signal Name	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
GG 1020	4*	+14 vdc LGC Supply	14.0±0.4 vdc	0%
GG 1030	4	+4 vdc LGC Supply	4.0±0.2 vdc	0%
GG 1040	5**	+120 vdc PIPA Supply	120±6.0 vdc	1%
GG 1070	4	+4 vdc CDU Supply	4.0±0.2 vdc	0%
GG 1100	4	-28 vdc Supply	-27.5±6.0 vdc	0%
GG 1110	5	2.5 vdc Telemetry Bias No. 1	2.5±.06 vdc	0%
GG 1201	5	IMU 28V 800 cps 1%	28.00±0.56V rms	1%
GG 1202	4	IMU 28V 800 cps 5%	28.0±1.4V rms	0.33%
GG 1203	4	IMU 28V 800 cps 5%	28.0±2.1V rms	0.33%
GG 1331	5	3.2 kc 28V Supply 1%	28.6±0.56V rms	1%
GG 1500	4	+28 vdc IMU OPER BUS	28.0-3.5, +5.5 vdc	0%
GG 1510	4	+28 vdc IMU STBY BUS (Stby mode)	28.0-6.0, +5.5 vdc	0%
GG 1513X	5	+28 vdc IMU STBY/OFF	28.0±1 vdc	0%
GG 1520	4	+28 vdc LGC OPER BUS	28.0-3.5, +5.5 vdc	0%
GG 1523X	5	+28 vdc LGC Operate	28.0±1 vdc	0%
GG 2001	5	X PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
GG 2021	5	Y PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
GG 2041	5	Z PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
GG 2106	4	IG Servo Error Total	0.0±60 MV rms at null	1%
GG 2110	4	IG Torque Motor Current	0.125 AMP Max during any fine Align Torque	0%
GG 2112	5	IG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 2113	5	IG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 2136	4	MG Servo Error Total	0.0±60 MV rms at null	1%
GG 2140	4	MG Torque Motor Current	0.125 AMP Max during any fine Align Torque	0%
GG 2142	5	MG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 2143	5	MG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 2166	4	OG Servo Error Total	0.0±60 MV rms at null	1%
GG 2170	4	OG Torque Motor Current	0.125 AMP Max during fine Align Torque	0%
GG 2172	5	OG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 2173	5	OG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 2219	5	Pitch Attitude Error	5.05±0.5V rms at 17°	0.67%
GG 2221	4	IG CDU Coarse Error	0.0±0.68V rms at null	0.29%
GG 1510	4	+28 vdc IMU STBY BUS (Oper. mode)	28.0-4.5, +4.5 vdc	0%

* Link 4 - PSAAM Output Signal

** Link 5 - SCA Output Signal

APPENDIX I (Continued)

Signal	Link	Signal Name	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
GG 2249	5	YAW Attitude Error	5.05±0.5V rms at 17°	0.67%
GG 2251	4	MG CDU Coarse Error	0.0±0.68V rms at null	0.29%
GG 2279	5	Roll Attitude Error	5.05±0.5V rms at 17°	0.67%
GG 2281	4	OG CDU Coarse Error	0.0±0.68V rms at null	0.29%
GG 2300	5	PIPA Temperature	130.5±1.5°F in Operate	2%
GG 2302	4	IMU Heater Current On	28±1 vdc	0%
GG 3304	5	RR Shaft 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 3305	5	RR Shaft 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 3312	4	RR Shaft CDU Coarse Error	0.0±0.68V rms at null	1%
GG 3322	4	RR Trunnion CDU Coarse Error	0.0±0.68V rms at null	1%
GG 3324	5	RR Trunnion 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 3325	5	RR Trunnion 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 4300	4	LGC Temperature	87.5±42.5°F	0.23%
GG 6020	4	PIPA Calibration Module Temperature	67.5±22.5°F	0.23%
GG 6021	4	PSA Temperature	85±25.0°F	0%
NG 1336	4	PHDIFF 3.2KC 28V/LGC SYNC	0° ±10°	3%
NG 1021	4	14 VDC LGC Noise RMS	0.2 VRMS Max	0%
NG 1022	4	14 VDC LGC Noise Peak	5 volts with rise time of 2 to 5 μsec	0%
NG 1031	4	4 VDC LGC Noise RMS	0.2 VRMS Max	0%
NG 1032	4	4 VDC LGC Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1071	4	4 VDC CDU Noise RMS	0.1 VRMS Max	0%
NG 1072	4	4 VDC CDU Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1501	4	28 VDC IMU Operate Noise RMS	1.0 VRMS Max	0%
NG 1502	4	28 VDC IMU Operate Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1511	4	28 VDC IMU Standby Noise RMS	1.0 VRMS Max	0%
NG 1512	4	28 VDC IMU Standby Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1521	4	28 VDC LGC Operate Noise RMS	2.0 VRMS Max	0%
NG 1522	4	28 VDC LGC Operate Noise Peak	5.0 volts with rise time of 2 to 50 μsec	0%

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POST INSTALLATION CHECKOUT PROCESS SPECIFICATION FOR LM G&N SYSTEM (KSC) WITH LUMINARY FLIGHT ROPES

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				AC	NASA
11/13/68	A	37021	2, 23-109, was 109 pages; now	EA	WLS
			110 pages.		
6/9/69	B	37638	2, 14, 15, 19, 21-110, was 110	EA	RJJ
			pages; now 115 pages.		

This specification consists of page 1 to 115 inclusive.

APPROVALS	**NASA/MSC**	**MIT/IL**	CCB	JH AC

1.0 INTRODUCTION

1.1 The individual Spacecraft (SC) installed Guidance and Navigation (G&N) System to be checked out per this process specification shall consist of one of each of the following major assemblies. The applicable part numbers shall be determined by Drawing No. 6014999.

Assembly Name

1 - Apollo Guidance Computer Group

1 - Inertial Meas. Unit & Pulse Torque Assembly

1 - Coupling Data Unit

1 - Power and Servo Assembly

1 - Computer Control & Reticle Dimmer Assembly

1 - G&N Interconnect Harness Assembly (LEM)

1 - Signal Conditioner Assembly

1 - Navigation Base Assembly (LEM)

1 - Alignment Optical Telescope (LEM)

1.2 The G&N System herein shall be identified as a LM system. The computer contains the program flight ropes in the core rope memory. The test requirements herein are based on LUMINARY 69, LUN 69-R2, LUMINARY 97 and LUMINARY 99.

2.0 SCOPE

2.1 This specification outlines the checkout requirements for G&N System installed in a Lunar Module Vehicle. Addendum to this specification will cover any special checkout requirements associated with individual vehicles, G&N Systems and Computer Flight Programs.

6.2.2.4.1 (Cont)
VERB 21 NOUN 01 ENTR
01036 ENTR
40000 ENTR
Verify NO ATT lamp is OFF

6.2.2.5 Pull out +28 VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11 to remove LGC OPERATE power.

6.2.2.6 Pull out +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11 to remove IMU STANDBY power.

6.2.3 Initial Turn-On Procedure

6.2.3.1 The initial power turn-on sequence shall be in the order specified in the test procedures (6.3) observing all cautions and delays as specified.

6.2.4 General Turn-On Procedure

6.2.4.1 This step shall be effective only after having completed the initial turn-on procedures.

6.2.4.2 Proper coolant flow shall be verified.

6.2.4.3 Depress +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11 to supply IMU STANDBY power. Record time.

6.2.4.4 Depress +28 VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11 to supply LGC OPERATE power. The Restart lamp may come on; if it does, press RSET on the DSKY.

6.2.4.5 On K-148, enter the following:

VERB 36 ENTR

6.2.4.6 Verify the appropriate K-START tape for LM Self-Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.4.7 Start tape reader.

6.2.4.8 When tape reader stops, verify:

R1 = +YYYYY (The value of YYYYY is Flight Rope Dependent and is found in Appendix II.)
R2 = +10538 (tape number)
R3 = 000XX (tape revision number)

6.2.4.9 Start tape reader.

6.2.4.10 When tape reader stops, verify:

R1 = 00101

6.2.4.11 Start tape reader

6.2.4.12 Monitor DSKY until R2 (SCOUNT+1) increments twice. If an error is detected, the PROG alarm lamp on the DSKY shall light.

6.2.4.13 On K-148 enter the following to turn off Self-Check:

VERB 21 NOUN 27 ENTR
00000 ENTR
VERB 34 ENTR

6.2.4.14 CAUTION: LGC OPERATE and IMU STANDBY power must have been applied a minimum of two hours before energizing the IMU OPERATE circuit breaker in Step 6.2.4.19, unless all of the following conditions are met:

IF: 1. The G&N System has previously been in Standby Mode at least two hours and subsequently been in Operate Mode, AND

2. The gimbals are placed in a parked position prior to shutdown, AND

3. The shutdown period did not exceed 5 days with the gimbals parked at:

0° ±5°
0° ±5°
90° ±5°, OR

3.a. The shutdown period did not exceed 12 days and the gimbals were parked at:

0° ±1°
0° ±1°
90° ±1°, AND

4. The Spacecraft or IMU have not been moved in any way during the shutdown period.

THEN: The two-hour Standby Mode operation requirement is reduced to 15 minutes.

6.2.4.15 The G&N System is defined as being in Standby Mode when LGC OPERATE and IMU STANDBY power is applied and IMU OPERATE power is off. The inertial components shall have suspension power in Standby Mode.

6.2.4.16 The G&N System is defined as being in Operate Mode when LGC OPERATE, IMU STANDBY and IMU OPERATE power are applied to the system.

6.2.4.17 Set up analog recorder to monitor the following signals:

Signal No.	Signal Name
a. GG 2136	MG Servo Error Total
b. GG 2106	IG Servo Error Total
c. GG 2166	OG Servo Error Total
d. GG 2112	IG 1X Resolver Sine
e. GG 2172	OG 1X Resolver Sine
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1% 800 CPS

6.3.1.5.1.2 Verify the appropriate K-START tape for LM Self-Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.1.5.1.3 Start tape reader.

6.3.1.5.1.4 When tape reader stops, verify:

R1 = +YYYYY (The value of YYYYY is Flight Rope Dependent and is found - in Appendix II.)
R2 = +10538 (tape number)
R3 = -000XX (tape revision number)

6.3.1.5.1.5 Load E-Memory Program.

6.3.1.5.1.5.1 Start tape reader.

6.3.1.5.1.5.2 When tape reader stops, verify R1 displays +00101.

6.3.1.5.1.6 Initiate Self-Check.

6.3.1.5.1.6.1 Start Tape reader.

6.3.1.5.1.6.2 When R2 = 00002, start tape reader.

6.3.1.5.1.6.3 When tape reader stops, wait 60 seconds.

6.3.1.5.2 DSKY Check.

6.3.1.5.2.1 Start tape reader.

6.3.1.5.2.2 All the electroluminescent elements (PROG, VERB, NOUN, and Row 1, Row 2, Row 3) shall display the decimal number nine (9). Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Rows 1, 2, 3
l. VERB-NOUN Flashing
m. COMP ACTY

On concurrently for 5 seconds.

6.3.1.5.3.2 (Continued) 8's remain in the VERB-NOUN display.
+8's remain in DSKY Row's 1, 2 and 3 display.

6.3.1.5.3.3 On K-148 enter the following sequence:

VERB 21	NOUN 01	ENTR
01036		ENTR
40004		ENTR

On the DSKY verify the "VEL" light is ON.

6.3.1.5.3.3.1 On K-148 enter the following sequence:

press	ENTR
01036	ENTR
40020	ENTR

On the DSKY verify the "ALT" light is ON and the "VEL" light is off.

6.3.1.5.3.3.2 On K-148 enter the following sequence:

press	ENTR
01036	ENTR
40001	ENTR

On the DSKY verify that the first spare lamp under the OPR ERR light is ON and the "ALT" light is OFF.

6.3.1.5.3.3.3 On K-148 enter the following sequence:

press	ENTR
01036	ENTR
40002	ENTR

On the DSKY verify that the second spare lamp under the OPR ERR light is ON and the first spare is OFF.

6.3.1.5.3.3.4 On K-148 enter the following sequence:

press	ENTR
01036	ENTR
40000	ENTR

On the DSKY verify "ALT", "VEL", and two spare lights under OPR ERR are OFF.

6.3.1.5.4 Uplink Check.

6.3.1.5.4.1 On K-START 148, set LOAD/INHIBIT switch to LOAD, set TAPE/KEY switch to KEY, then enter the following:

6.3.1.5.4.1 (Continued)

ERROR RESET
VERB 25 NOUN 01 ENTR
03375 ENTR
+01234 ENTR
-56789 ENTR
+00000 ENTR

6.3.1.5.4.2 Verify the following is displayed on the DSKY.

VERB 23 NOUN 01
R1 +01234
R2 -56789
R3 +00000

6.3.1.5.5 Downlink Check

6.3.1.5.5.1 On CRT DSKY display, verify the following is displayed:

VERB 23 NOUN 01
R1 +01234
R2 -56789
R3 +00000

6.3.1.5.6 LGC Standby Check

6.3.1.5.6.1 On K-148, enter the following:

VERB 37 ENTR
06 ENTR

Observe VERB 50 NOUN 25 flashing.
R1 = 00062 (switch LGC power down)

6.3.1.5.6.2 On DSKY, depress PRO pushbutton for approximately 3 seconds.

6.3.1.5.6.3 Verify STBY status indicator lamp is ON.

6.3.1.5.6.4 On the CRT, verify the 3.2 KC 28V Supply (CG 1331) is between 28.04 and 29.16V RMS.

6.3.2 Alarms and Interrupts Test

6.3.2.1 Verify the appropriate K-START tape for LM Alarms and Interrupt Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.2.2 Start the tape reader.

6.3.2.3 When the tape reader stops, verify:

R1 = +YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix H.)
R2 = +10545 (Tape number)
R3 = +000XX (Revision number)

6.3.2.4 Start the tape reader.

6.3.2.4.1 When the tape reader stops, verify:

R1 = 00100

6.3.2.5 Parity Fail Test

6.3.2.5.1 Start the tape reader.

6.3.2.5.2 When the tape reader stops, verify:

a. On the DSKY, the RESTART lamp is lit.
b. The PGNS Caution lamp is lit.

6.3.2.5.3 On the DSKY, press the RSET pushbutton. Verify RESTART and PGNS Caution lamps are not lit.

6.3.2.5.4 Start the tape reader.

6.3.2.5.5 When the tape reader stops, verify:

R1 = 00101

6.3.2.5.6 Start the tape reader

6.3.2.5.7 When the tape reader stops, verify:

R1 = 00200

6.3.2.6 Rupt Lock Test

6.3.2.6.1 Start the tape reader.

6.3.2.6.2 When the tape reader stops, verify:

a. On the DSKY, the RESTART lamp is lit.
b. The PGNS Caution lamp is lit.

6.3.2.6.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNS Caution lamps are not lit.

6.3.2.6.4 Start the tape reader.

6.3.2.6.5 When the tape reader stops, verify:

R1 = 00201

6.3.2.6.6 Start the tape reader.

6.3.2.6.7 When the tape reader stops, verify:

R1 = 00300

6.3.2.7 TC Trap Test

6.3.2.7.1 Start the tape reader.

6.3.2.7.2 When the tape reader stops, verify:

a. On the DSKY the RESTART lamp is lit.
b. The PGNS Caution lamp is lit.

6.3.2.7.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNS Caution lamps are not lit.

6.3.2.7.4 Start the tape reader.

6.3.2.7.5 When the tape reader stops, verify:

R1 = 00301

6.3.2.7.6 Start the tape reader.

6.3.2.7.7 When the tape reader stops, verify:

a. On the DSKY, the RESTART lamp is lit.
b. The PGNS Caution lamp is lit.

6.3.2.7.8 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNS Caution lamps are not lit.

6.3.2.7.9 Start the tape reader.

6.3.2.7.10 When the tape reader stops, verify:

R1 = 00302

6.3.2.7.11 Start the tape reader.

6.3.2.7.12 When the tape reader stops, verify:

R1 = 00400

6.3.2.8 Nightwatchman Test

6.3.2.8.1 Start the tape reader.

6.3.2.8.2 When the tape reader stops, verify:

a. The RESTART lamp on the DSKY is lit.
b. The PGNCS Caution lamp is lit.

6.3.2.8.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNCS Caution lamps are not lit.

6.3.2.8.4 Start the tape reader.

6.3.2.8.5 When the tape reader stops, verify:

R1 = 00401

6.3.3 IMU Operate Power On Tests

CAUTION: Prior to application of IMU OPERATE power in step 6.3.3.1.4, LGC OPERATE and IMU STANDBY power must have been applied to the G&N System continuously for a minimum of two hours. The only exception is when the requirements of step 6.2.4.14 are met and this does not apply for the initial application of IMU OPERATE power.

6.3.3.1 Verification of Power Turn-On

6.3.3.1.1 Set up analog recorder to monitor the following signals:

	SIGNAL NO.	SIGNAL NAME
a.	GG 2136	MG Servo Error Total
b.	GG 2106	IG Servo Error Total
c.	GG 2166	OG Servo Error Total
d.	GG 2112	IG 1X Resolver Sine
e.	GG 2172	OG 1X Resolver Sine
f.	GG 2142	MG 1X Resolver Sine
g.	GG 1201	IMU 28V 1% 800 cps
h.	SPARE	

6.3.3.1.2 On CRT, monitor +120 VDC PIPA SUPPLY (GG 1040) and IMU gimbal angles.

6.3.3.1.3 Press in +28 VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11. Record time.

6.3.3.1.3.1 Verify that the "NO ATT" lamp on the DSKY is lighted.

6.3.3.1.4 Verify on analog recorder that the oscillations of the resolver sine signals (GG 2112, GG 2172, and GG 2142) are not sustained and that the signals damp out within 15 seconds. If they don't, remove IMU OPERATE power as soon as possible.

6.3.3.1.5 On the CRT, verify absence of +120 VDC PIPA SUPPLY voltage for 90±10 seconds after step 6.3.3.1.3 is initiated. Verify that this voltage is between 114 and 126 after 100 seconds from step 6.3.3.1.3.

6.3.3.1.6 On event recorder verify the following:

LGC WARNING is OFF (GG 9001)
ISS WARNING is OFF (GG 9002)

6.3.3.1.6.1 On DSKY, verify that the "NO ATT" lamp is off.

6.3.3.1.7 On CRT, verify all IMU gimbal angles indicate approximately 0 degrees.

6.3.3.1.8 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.4 Temperature Control Verification

6.3.4.1 After IMU OPERATE turn-on, periodically check the PIPA TEMP for the next 15 minutes. The PIPA TEMP shall be 130.5±2.0°F. Fifteen (15) minutes after IMU OPERATE turn on the PIPA temperature shall be within 0.5°F of its stabilized value (para 6.3.4.3).

6.3.4.2 When 1 hour has elapsed from the time of IMU OPERATE power turn-on, monitor PIPA TEMP (GG 2300) on the CRT. Monitor and record temperature readings every 5 minutes for 30 minutes. Verify that each reading does not deviate from the average value of each signal by more than 0.1°F.

6.3.4.3 The PIPA Temp shall be 130.5±1.5°F.

6.3.4.4 Verify on the event recorder that IMU Blower Current (GG 2303) and IMU Heater Current (GG 2302) On discretes have been present for the last hour (discretes may cycle off).

6.3.5 PGNCS Power Supply Tests

6.3.5.1 From the CRT, confirm power supply voltages (or temperatures) are as specified and record values observed.

6.3.5.2 The PIPA Calibration Module Temperature (GG 6020) shall be between +45 and +90 DEG F.

6.3.5.3 The PSA Temperature (GG 6021) shall be between +60 and +110 DEG F.

6.3.5.4 The LGC Temperature (GG 4300) shall be between +45 and +130 DEG. F.

6.3.5.5 The +28 VDC IMU OPERATE BUS (GG 1500) shall be between 24.5 and 33.5 VDC.

6.3.5.6 The +28 VDC IMU STANDBY BUS (GG 1510) shall be between 23.5 and 32.5 VDC.

6.3.5.7 The +28 VDC LGC OPERATE BUS (GG 1520) shall be between 24.5 and 33.5 VDC.

6.3.5.8 The +120 VDC PIPA Supply (GG 1040) shall be between 114 and 126 VDC.

6.3.5.9 The -28 VDC Supply (GG 1100) shall be between -21.5 and -33.5 VDC.

6.3.5.10 The +4 VDC CDU Supply (GG 1070) shall be between 3.8 and 4.2 VDC.

6.3.5.11 The IMU 28V 800 CPS 1 pct Supply (GG 1201) shall be between 27.44 and 28.56 VRMS.

6.3.5.12 The IMU 28V 800 CPS 5 pct 90 PH Supply (GG 1202) shall be between 26.6 and 29.4 VRMS.

6.3.5.13 The IMU 28V 800 CPS 5 pct 0 PH Supply (GG 1203) shall be between 25.9 and 30.1 VRMS.

6.3.5.14 The 3.2 KC 28V Supply (GG 1331) shall be between 28.04 and 29.16 VRMS.

6.3.5.15 The 2.5 VDC T/M Bias (GG 1110) shall be between 2.44 and 2.56 VDC.

6.3.5.16 The +14 VDC LGC Supply (GG 1020) shall be between 13.6 and 14.4 VDC.

6.3.5.17 The +4 VDC LGC Supply (GG 1030) shall be between 3.8 and 4.2 VDC.

6.3.5.18 The phase difference between the 3.2 KC supply and LGC sync shall be 0±10° (NG 1336).

6.3.5.19 Record the noise levels of the following signals displayed on the CRT.

Item No.	Measurement No.	Signal	Requirement
a.	NG 1021	14 VDC LGC Noise RMS	<0.2 VRMS
b.	NG 1031	4 VDC LGC Noise RMS	<0.2 VRMS
c.	NG 1071	4 VDC CDU Noise RMS	<0.1 VRMS
d.	NG 1501	28 VDC IMU Operate Noise RMS	<1.0 VRMS
e.	NG 1511	28 VDC IMU Standby Noise RMS	<1.0 VRMS
f.	NG 1521	28 VDC LGC Operate Noise RMS	<2.0 VRMS

6.3.5.20 The noise peaks of the following signals are demonstrated on the event light when the peaks have a rise time between 2 and 50 μsec and the peak

6.3.5.20 (Cont) voltage exceeds 5 volts.

Item No.	Measurement No.	Signal
a.	NG 1022	14 VDC LGC Noise Peak
b.	NG 1032	4 VDC LGC Noise Peak
c.	NG 1072	4 VDC CDU Noise Peak
d.	NG 1502	28 VDC IMU Operate Noise Peak
e.	NG 1522	28 VDC LGC Operate Peak

6.3.5.21 The noise peaks of the following signals are demonstrated on the event light when the peaks have a rise time of between 2 and 50 μsec and the peak voltage exceeds 10 volts.

a.	NG 1512	28 VDC IMU Standby Peak.

6.3.6 G&N Operational Test

NOTE: Manual DSKY entries during this test may result in a test abort.

6.3.6.1 Verify the appropriate K-START tape for LM G/N OPCHK is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.6.1.1 Start tape reader.

6.3.6.1.2 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +YYYYY (The value of YYYYY is Flight Rope Dependent and is found in Appendix II.)

b. R2 = +10531 (tape number)

c. R3 = -000XX (tape revision number)

6.3.6.2 E-Memory Program Load and Sum Check

6.3.6.2.1 Start tape reader.

6.3.6.2.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00101.

6.3.6.3 Local g Measurement.

6.3.6.3.1 Start tape reader.

6.3.6.3.2 In approximately 10 minutes, VERB 06 NOUN 98 shall flash.

6.3.6.3.3 From the CRT DSKY display read and record Row 1 and Row 2 (local gravity whole and fractional respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.3.6.4 Horizontal Earth Rate Measurement

6.3.6.4.1 Press PRO pushbutton on DSKY.

6.3.6.4.2 In approximately 2 seconds VERB 06 NOUN 98 shall flash. From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.3.6.5 Enter the following on K-148:

VERB 34	ENTR
VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR

6.3.7 Semi-Automatic Mode Test

6.3.7.1 Verify the appropriate K-START tape for LM Semi-Automatic Mode Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.7.1.1 Start tape reader.

6.3.7.1.2 When tape reader stops verify the following on CRT DSKY

a. R1 = +YYYYY (The value of YYYYY is Flight Rope Dependent and is found in Appendix II.)
b. R2 = +10530 (tape number)
c. R3 = -000XX (tape revision number)

6.3.7.2 E-Memory Program Load

6.3.7.2.1 Start tape reader.

6.3.7.2.2 When tape reader stops verify the following on CRT DSKY:

R1 = 00101

6.3.7.3 Command Accuracy 0°.

6.3.7.3.1 Start tape reader.

6.3.7.3.2 When tape stops verify that CRT DSKY R1 indicates 00201. Wait 15 seconds.

6.3.7.3.3 Read and record CRT IMU Gimbal angles. The indications shall be 000±003 degrees.

6.3.7.3.4 Read and record CRT CDU angle indications. The indications shall be +000.00±001.50.

6.3.7.4 Command Accuracy 45°.

6.3.7.4.1 Start tape reader.

6.3.7.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00301. Wait 5 seconds.

6.3.7.4.3 Read and record CRT IMU Gimbal angles. The indications shall be 045±003 degrees.

6.3.7.4.4 Read and record CRT CDU angle indications. Indications shall be +045.00±001.50.

6.3.7.5 CDU Repeating Accuracy 45°.

6.3.7.5.1 Start the tape reader.

6.3.7.5.2 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.3.7.6 Command Accuracy 90°.

6.3.7.6.1 Start tape reader.

6.3.7.6.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00501. GIMBAL LOCK lamp will be lit. Wait 5 seconds.

6.3.7.6.3 Read and record CRT indication of IMU Gimbal angles. The indications shall be 090±003 degrees.

6.3.7.6.4 Read and record CRT CDU angle indications. Indications shall be +090.00±001.50.

6.3.7.7 Command Accuracy 135°.

6.3.7.7.1 Start tape reader.

6.3.7.7.2 When tape reader stops verify CRT DSKY Row 1 indicates 00601. Wait 5 seconds.

6.3.7.7.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 135±003 degrees.

6.3.7.7.4 Read and record CRT CDU angle indications. Indications shall be +135.00±001.50.

6.3.7.8 CDU Repeating Accuracy 135°.

6.3.7.8.1 Start tape reader.

6.3.7.8.2 When tape reader stops verify CRT DSKY Row 1 indicates 00701. Wait 10 seconds, verify GIMBAL LOCK lamp on DSKY is not lit.

6.3.7.8.3 Start tape reader.

6.3.7.8.4 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 will flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.3.7.9 Plus Gimbal Lock Test.

6.3.7.9.1 Start tape reader.

6.3.7.9.2 When tape reader stops wait approximately 10 seconds. Verify CRT DSKY Row 1 indicates 01101. Verify GIMBAL LOCK lamp is lit.

6.3.7.10 Command Accuracy 225°.

6.3.7.10.1 Start tape reader.

6.3.7.10.2 When tape reader stops verify CRT DSKY Row 1 indicates 01201. GIMBAL LOCK lamp will be lit. Wait 15 seconds.

6.3.7.10.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 225±003 degrees.

6.3.7.10.4 Read and record CRT CDU angle indications. Indications shall be +225.00±001.50.

6.3.7.11 CDU Command Rate Test

6.3.7.11.1 Start tape reader.

6.3.7.11.2 When tape reader stops verify CRT DSKY display Row 1 indicates 01301. Wait 10 seconds. Verify IMU Gimbals are at approximately 0°.

6.3.7.11.3 Middle Gimbal Rate Test

6.3.7.11.3.1 Start tape reader.

6.3.7.11.3.2 When tape reader stops immediately verify display of 01401 in Row 1 of CRT DSKY display. In approximately 12 seconds VERB 23 NOUN 26 shall flash. The GIMBAL LOCK lamp shall be lit. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.3.7.11.4 Inner Gimbal Rate Test

6.3.7.11.4.1 Start tape reader.

6.3.7.11.4.2 Approximately 12 seconds after the tape reader stops VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.3.7.11.5 Outer Gimbal Rate Test.

6.3.7.11.5.1 Start tape reader.

6.3.7.11.5.2 Approximately 12 seconds after the tape reader stops VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.3.7.11.6 Start tape reader.

6.3.7.11.6.1 Wait 15 seconds. Verify IMU Gimbals are at approximately 0°.

6.3.7.12 Command Accuracy 315°.

6.3.7.12.1 Start tape reader.

6.3.7.12.2 When tape reader stops verify CRT DSKY Row 1 indicates 01501.

6.3.7.12.3 Read and record CRT IMU Gimbal Angles. Indication shall be 315±003 degrees.

6.3.7.12.4 Read and record CRT CDU angle indications. Indications shall be +315.00±001.50.

6.3.7.13 CDU Repeating Accuracy 315°.

6.3.7.13.1 Start tape reader.

6.3.7.13.2 Approximately 5 seconds after the tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.3.7.14 Minus Gimbal Lock Test.

6.3.7.14.1 Start tape reader.

6.3.7.14.2 When tape reader stops verify CRT DSKY Row 1 indicates 01701. Verify GIMBAL LOCK lamp is lit after approximately 5 seconds.

6.3.7.15 CDU Repeating Accuracy 225°.

6.3.7.15.1 Start tape reader.

6.3.7.15.2 When tape reader stops verify CRT DSKY Row 1 indicates +00016. Wait 10 seconds before continuing.

6.3.7.15.3 Start tape reader.

6.3.7.15.4 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 will flash. Read and record CRT DSKY Row 1, 2 and 3 indications. Recorded values shall be between 77770 and 00007.

6.3.7.16 OG CDU Fine Fail Test.

6.3.7.16.1 Start tape reader.

6.3.7.16.2 When tape reader stops verify CRT DSKY Row 1 indicates 02101.

6.3.7.16.3 Start tape reader.

6.3.7.16.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes, verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.16.5 Start tape reader.

6.3.7.16.6 Approximately 4 seconds after tape reader stops, verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.17 IG CDU Fine Fail Test

6.3.7.17.1 Start tape reader.

6.3.7.17.2 When tape reader stops verify CRT DSKY Row 1 indicates 02201.

6.3.7.17.3 Start tape reader.

6.3.7.17.4 Approximately 10 seconds after the tape reader stops, VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes, verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.17.5 Start tape reader.

6.3.7.17.6 Approximately 4 seconds after tape reader stops, verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.18 MG CDU Fine Fail Test.

6.3.7.18.1 Start tape reader.

6.3.7.18.2 When tape reader stops verify CRT DSKY Row 1 indicates 02301.

6.3.7.18.3 Start tape reader.

6.3.7.18.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify, ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.18.5 Start tape reader.

6.3.7.18.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.19 OG CDU Coarse Fail Test

6.3.7.19.1 Start tape reader.

6.3.7.19.2 When tape reader stops verify CRT DSKY Row 1 indicates 02401.

6.3.7.19.3 Start tape reader.

6.3.7.19.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.19.5 Start tape reader.

6.3.7.19.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.20 IG CDU Coarse Fail Test

6.3.7.20.1 Start tape reader.

6.3.7.20.2 When tape reader stops verify CRT DSKY Row 1 indicates 02501.

6.3.7.20.3 Start tape reader.

6.3.7.20.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.20.5 Start tape reader.

6.3.7.20.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.21 MG CDU Coarse Fail Test

6.3.7.21.1 Start tape reader.

6.3.7.21.2 When tape reader stops verify CRT DSKY Row 1 indicates 02601.

6.3.7.21.3 Start tape reader.

6.3.7.21.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.21.5 Start tape reader.

6.3.7.21.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.22 FDAI Linearity Test.

6.3.7.22.1 Start tape reader.

6.3.7.22.2 When tape reader stops verify that CRT DSKY Row 1 indicates 02701. Wait 5 seconds.

6.3.7.22.3 Start tape reader.

6.3.7.22.4 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates +00017.
PITCH ATT ERROR is between +15.3 and +18.7 DEG (GG 2219)
YAW ATT ERROR is between +15.3 and +18.7 DEG (GG 2249)
ROLL ATT ERROR is between +15.3 and +18.7 DEG (GG 2279)

6.3.7.22.5 Start tape reader.

6.3.7.22.6 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates +00016.
PITCH ATT ERROR is between +14.4 and +17.6 DEG (GG 2219)
YAW ATT ERROR is between +14.4 and +17.6 DEG (GG 2249)
ROLL ATT ERROR is between +14.4 and +17.6 DEG (GG2279)

6.3.7.22.7 Start tape reader.

6.3.7.22.8 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates +00006.
PITCH ATT ERROR is between +05.4 and +06.6 DEG (GG 2219)
YAW ATT ERROR is between +05.4 and +06.6 DEG (GG 2249)
ROLL ATT ERROR is between +05.4 and +06.6 DEG (GG 2279)

6.3.7.22.9 Start tape reader.

6.3.7.22.10 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates +00000.
PITCH ATT ERROR is between +00.2 and -00.2 DEG (GG 2219)
YAW ATT ERROR is between +00.2 and -00.2 DEG (GG 2249)
ROLL ATT ERROR is between +00.2 and -00.2 DEG (GG 2279)

6.3.7.22.11 Start tape reader.

6.3.7.22.12 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates -00006.
PITCH ATT ERROR is between -05.4 and -06.6 DEG (GG 2219)
YAW ATT ERROR is between -05.4 and -06.6 DEG (GG 2249)
ROLL ATT ERROR is between -05.4 and -06.6 DEG (GG 2279)

6.3.7.22.13 Start tape reader.

6.3.7.22.14 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates -00016.
PITCH ATT ERROR is between -14.4 and -17.6 DEG (GG 2219)
YAW ATT ERROR is between -14.4 and -17.6 DEG (GG 2249)
ROLL ATT ERROR is between -14.4 and -17.6 DEG (GG 2279)

6.3.7.22.15 Start tape reader.

6.3.7.22.16 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates -00017.
PITCH ATT ERROR is between -15.3 and -18.7 DEG (GG 2219)
YAW ATT ERROR is between -15.3 and -18.7 DEG (GG 2249)
ROLL ATT ERROR is between -15.3 and -18.7 DEG (GG 2279)

6.3.7.23 On K-148 enter VERB 34 ENTER

The proper operation of the IMU CAGE function (consisting of steps 6.3.7.23.1 through 6.3.7.23.7) need be performed only once during the initial PGNCS Operational Test and omitted from subsequent testing of test 6.3.7.

6.3.7.23.1 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00200 ENTR
+00200 ENTR
+00200 ENTR

6.3.7.23.2 Observe that the NO ATT lamp on the DSKY lights and that the CDUX, CDUY and CDUZ angles on the CRT indicate approximately +00200.

6.3.7.23.3 On analog recorder, monitor the following signals:

Signal No.	Signal Name
a. GG 2136	MG Servo Error Total
b. GG 2106	IG Servo Error Total
c. GG 2166	OG Servo Error Total
d. GG 2112	IG 1X Resolver Sine
e. GG 2172	OG 1X Resolver Sine
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1% 800 cps

6.3.7.23.4 Start analog recorder to a chart speed of 5 mm/sec.

6.3.7.23.5 On LEM Cabin Panel 4, hold IMU CAGE momentary toggle switch in the ON position. (Do not release).

6.3.7.23.6 On analog recorder, verify the 1X Resolver Sine signals (GG 2112, GG 2172, GG 2142) null out to less than 0.5 VRMS. Release IMU CAGE switch to the OFF position. Disregard any momentary transients on the 1X Resolver Sine signals when the switch is released. Any sustained oscillations shall be cause for immediate removal of IMU Operate Power.

6.3.7.23.7 On the CRT, verify that the CDUX, CDUY and CDUZ angles are all between +00150 and +35850.

6.3.7.24 Stop analog recorder.

6.3.7.24.1 On K-148 enter the following:

VERB 36 ENTR wait 10 seconds
VERB 43 ENTR
+01700 ENTR

6.3.7.24.1 (Cont)

+00600 ENTR
-01700 ENTR

On CRT, verify the following:

YAW ATT ERROR is between +15.3 and +18.7 DEG (GG 2249)
PITCH ATT ERROR is between +05.5 and +06.6 DEG (GG 2219)
ROLL ATT ERROR is between -15.3 and -18.7 DEG (GG 2279)

6.3.7.25 On K-148 enter the following:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.8 IRIG Scale Factor Test

6.3.8.1 Verify the appropriate K-START tape for IRIG Scale Factor Test is on the K-START tape reader. The test numbers and their associated Flight Ropes are found in Appendix II.

6.3.8.2 Start tape reader.

6.3.8.2.1 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +YYYYY (The value of YYYYY is Flight Rope Dependent and is found in Appendix II.)
b. R2 = +00083 (tape number)
c. R3 = -000XX (tape revision number)

6.3.8.2.2 Start tape reader.

6.3.8.2.3 When tape reader stops, wait 20 seconds.

6.3.8.3 E-Memory Program Load.

6.3.8.3.1 Start tape reader.

6.3.8.3.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00000.

6.3.8.4 Test Position Data Load (+X Scale Factor)

6.3.8.4.1 Start tape reader.

6.3.8.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.3.8.4.3 Start tape reader

6.3.8.4.4 When tape reader stops, VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nave Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.4.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.4.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001).

6.3.8.5 Test Position Data Load (+Y Scale Factor)

6.3.8.5.1 Start tape reader.

6.3.8.5.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.3.8.5.3 Start tape reader.

6.3.8.5.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.5.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.5.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.3.8.6 Test Position Data Load (+Z Scale Factor).

6.3.8.6.1 Start tape reader.

6.3.8.6.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.3.8.6.3 Start tape reader.

6.3.8.6.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.6.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.6.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.3.8.7 Test Position Data Load (-X Scale Factor)

6.3.8.7.1 Start tape reader.

6.3.8.7.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.3.8.7.3 Start tape reader.

6.3.8.7.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.7.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.7.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.3.8.8 Test Position Data Load (-Y Scale Factor)

6.3.8.8.1 Start tape reader.

6.3.8.8.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.3.8.8.3 Start tape reader.

6.3.8.8.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTER into K-148 and enter correct azimuth.

6.3.8.8.4 (continued) If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.8.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.8.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.3.8.9 Test Position Data Load (-Z Scale Factor)

6.3.8.9.1 Start tape reader.

6.3.8.9.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.3.8.9.3 Start tape reader.

6.3.8.9.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.9.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.9.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.3.8.10 Test Position Data Load (+X Scale Factor)

6.3.8.10.1 Start tape reader.

6.3.8.10.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.3.8.10.3 Start tape reader.

6.3.8.10.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.10.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.10.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.3.8.11 Test Position Data Load (+Y Scale Factor)

6.3.8.11.1 Start tape reader.

6.3.8.11.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.3.8.11.3 Start tape reader.

6.3.8.11.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.11.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.11.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.3.8.12 Test Position Data Load (+Z Scale Factor)

6.3.8.12.1 Start tape reader.

6.3.8.12.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.3.8.12.3 Start tape reader.

6.3.8.12.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.12.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.12.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.3.8.13 Test Position Data Load (-X Scale Factor)

6.3.8.13.1 Start tape reader.

6.3.8.13.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.3.8.13.3 Start tape reader.

6.3.8.13.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.13.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.13.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.3.8.14 Test Position Data Load (-Y Scale Factor)

6.3.8.14.1 Start tape reader.

6.3.8.14.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.3.8.14.3 Start tape reader.

6.3.8.14.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.14.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.14.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.3.8.15 Test Position Data Load (-Z Scale Factor)

6.3.8.15.1 Start tape reader.

6.3.8.15.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.3.8.15.3 Start tape reader.

6.3.8.15.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

6.3.8.15.4 (continued) If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.15.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.15.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.3.8.16 Test Position Data Load (+X Scale Factor)

6.3.8.16.1 Start tape reader.

6.3.8.16.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00001.

6.3.8.16.3 Start tape reader.

6.3.8.16.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.16.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.16.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.3.8.17 Test Position Data Load (+Y Scale Factor)

6.3.8.17.1 Start tape reader.

6.3.8.17.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.3.8.17.3 Start tape reader.

6.3.8.17.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.17.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.17.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.3.8.18 Test Position Data Load (+Z Scale Factor)

6.3.8.18.1 Start tape reader.

6.3.8.18.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.3.8.18.3 Start tape reader.

6.3.8.18.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.18.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.18.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.3.8.19 Test Position Data Load (-X Scale Factor)

6.3.8.19.1 Start tape reader.

6.3.8.19.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.3.8.19.3 Start tape reader.

6.3.8.19.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.19.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.19.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.3.8.20 Test Position Data Load (-Y Scale Factor)

6.3.8.20.1 Start tape reader.

6.3.8.20.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.3.8.20.3 Start tape reader.

6.3.8.20.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.20.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.20.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.3.8.21 Test Position Data Load (-Z Scale Factor)

6.3.8.21.1 Start tape reader.

6.3.8.21.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.3.8.21.3 Start tape reader.

6.3.8.21.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.21.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.21.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.3.8.22 Test Position Data Load (+X Scale Factor)

6.3.8.22.1 Start tape reader.

6.3.8.22.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00001.

6.3.8.22.3 Start tape reader.

6.3.8.22.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

6.3.8.22.4 (continued) If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.22.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.22.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.3.8.23 Test Position Data Load (+Y Scale Factor)

6.3.8.23.1 Start tape reader.

6.3.8.23.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.3.8.23.3 Start tape reader.

6.3.8.23.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.23.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.23.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.3.8.24 Test Position Data Load (+Z Scale Factor)

6.3.8.24.1 Start tape reader.

6.3.8.24.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.3.8.24.3 Start tape reader.

6.3.8.24.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.24.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.24.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.3.8.25. Test Position Data Load (-X Scale Factor)

6.3.8.25.1 Start tape reader.

6.3.8.25.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.3.8.25.3 Start tape reader.

6.3.8.25.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.25.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.25.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.3.8.26 Test Position Data Load (-Y Scale Factor)

6.3.8.26.1 Start tape reader.

6.3.8.26.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.3.8.26.3 Start tape reader.

6.3.8.26.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.26.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.26.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.3.8.27 Test Position Data Load (-Z Scale Factor)

6.3.8.27.1 Start tape reader.

6.3.8.27.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.3.8.27.3 Start tape reader.

6.3.8.27.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.27.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.27.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.3.8.28 Terminate this test by entering the following into K-148:

VERB 36 ENTR Wait 10 seconds.
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.8.29 The four-run average Scale Factor Error for each of the six positions shall be 0 plus or minus 1750 ppm.

6.3.9 IMU Performance Test. A reference data sheet is provided at the end of this section to aid in data reduction.

6.3.9.1 Insure that IMU Operate power and LGC Operate power has been supplied for a minimum of one hour and that the IMU is not in a Gimbal Lock condition.

6.3.9.2 On CRT, monitor and record PIPA TEMP (CG 2300).

6.3.9.3 Verify the appropriate K-START tape for IMU Performance Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.9.4 Start tape reader.

6.3.9.4.1 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +YYYYY (The value of YYYYY is Flight Rope Dependent and is found in Appendix II.)
b. R2 = +00081 (tape number)
c. R3 = -000XX (tape revision number)

6.3.9.4.2 Start tape reader.

6.3.9.4.3 When tape reader stops, wait 10 seconds.

6.3.9.5 Start the tape reader. After 15 seconds, verify IMU is coarse aligned to zero degrees.

6.3.9.6 E-Memory Program Load.

6.3.9.6.1 Start the tape reader. When tape reader stops, verify the following DSKY display:

Row 1
Row 3

6.3.9.7 Test Position +00001.

6.3.9.7.1 E-Memory Program and Test Position Matrix Sum Check

6.3.9.7.1.1 Start tape reader.

6.3.9.7.1.2 When tape reader stops, verify DSKY Row 1 displays +00001.

6.3.9.7.2 Start tape reader.

6.3.9.7.2.1 When tape reader stops wait 20 seconds.

6.3.9.7.3 Test Initialization.

6.3.9.7.3.1 Start tape reader.

6.3.9.7.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.7.4 Horizontal Drift Test

6.3.9.7.4.1 Start tape reader.

6.3.9.7.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.7.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.7.5 Test Termination.

6.3.9.7.5.1 Start tape reader.

6.3.9.7.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.8 Test Position +00002.

6.3.9.8.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.8.1.1 Start tape reader.

6.3.9.8.1.2 When tape reader stops, verify DSKY Row 1 displays +00002.

6.3.9.8.2 Start tape reader.

6.3.9.8.2.1 When tape reader stops, wait 20 seconds.

6.3.9.8.3 Test Initialization.

6.3.9.8.3.1 Start tape reader.

6.3.9.8.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.8.4 Horizontal Drift Test.

6.3.9.8.4.1 Start tape reader.

6.3.9.8.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.8.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.8.5 PIPA Scale Factor Test.

6.3.9.8.5.1 Start tape reader.

6.3.9.8.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.3.9.8.6 Vertical Drift Test.

6.3.9.8.6.1 Start tape reader.

6.3.9.8.6.2 In approximately 67 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.3.9.8.7 Test Termination.

6.3.9.8.7.1 Start tape reader.

6.3.9.8.7.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.9 Test Position +00003.

6.3.9.9.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.9.1.1 Start tape reader.

6.3.9.9.1.2 When tape reader stops, verify DSKY Row 1 displays +00003.

6.3.9.9.2 Start tape reader.

6.3.9.9.2.1 When tape reader stops, wait 20 seconds.

6.3.9.9.3 Test Initialization.

6.3.9.9.3.1 Start tape reader.

6.3.9.9.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.9.4 Horizontal Drift Test

6.3.9.9.4.1 Start tape reader.

6.3.9.9.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.9.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.9.5 Test Termination.

6.3.9.9.5.1 Start tape reader.

6.3.9.9.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.10 Test Position +00004.

6.3.9.10.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.10.1.1 Start tape reader.

6.3.9.10.1.2 When tape reader stops, verify DSKY Row 1 displays +00004.

6.3.9.10.2 Start tape reader.

6.3.9.10.2.1 When tape reader stops, wait 20 seconds.

6.3.9.10.3 Test Initialization.

6.3.9.10.3.1 Start tape reader.

6.3.9.10.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.10.4 Horizontal Drift Test.

6.3.9.10.4.1 Start tape reader.

6.3.9.10.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.10.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.3.9.10.5 PIPA Scale Factor Test.

6.3.9.10.5.1 Start tape reader.

6.3.9.10.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.3.9.10.6 Vertical Drift Test.

6.3.9.10.6.1 Start tape reader.

6.3.9.10.6.2 In approximately 67 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.3.9.10.7 Test Termination.

6.3.9.10.7.1 Start tape reader.

6.3.9.10.7.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.11 Test Position +00005.

6.3.9.11.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.11.1.1 Start tape reader.

6.3.9.11.1.2 When tape reader stops, verify DSKY Row 1 displays +00005.

6.3.9.11.2 Start tape reader.

6.3.9.11.2.1 When tape reader stops, wait 20 seconds.

6.3.9.11.3 Test Initialization.

6.3.9.11.3.1 Start tape reader.

6.3.9.11.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.11.4 **PIPA Scale Factor Test**

6.3.9.11.4.1 Start tape reader. Record time.

6.3.9.11.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM and GIMBAL LOCK lamps shall be lit.

6.3.9.11.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.3.9.11.5 Test Termination.

6.3.9.11.5.1 Start tape reader.

6.3.9.11.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.12 Test Position +00006.

6.3.9.12.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.12.1.1 Start tape reader.

6.3.9.12.1.2 When tape reader stops, verify DSKY Row 1 displays +00006.

6.3.9.12.2 Start tape reader.

6.3.9.12.2.1 When tape reader stops, wait 20 seconds.

6.3.9.12.3 Test Initialization.

6.3.9.12.3.1 Start tape reader.

6.3.9.12.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.12.4 PIPA Scale Factor Test.

6.3.9.12.4.1 Start tape reader. Record time.

6.3.9.12.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM and GIMBAL LOCK lamps shall be lit.

6.3.9.12.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.3.9.12.5 Test Termination.

6.3.9.12.5.1 Start tape reader.

6.3.9.12.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.13 Test Position +00007.

6.3.9.13.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.13.1.1 Start tape reader.

6.3.9.13.1.2 When tape reader stops verify DSKY Row 1 displays +00007.

6.3.9.13.2 Start tape reader.

6.3.9.13.2.1 When tape reader stops, wait 20 seconds.

6.3.9.13.3 Test Initialization.

6.3.9.13.3.1 Start tape reader.

6.3.9.13.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.13.4 Horizontal Drift Test.

6.3.9.13.4.1 Start tape reader.

6.3.9.13.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.13.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.3.9.13.5 Test Termination.

6.3.9.13.5.1 Start tape reader.

6.3.9.13.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.14 Test Position +00008.

6.3.9.14.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.14.1.1 Start tape reader.

6.3.9.14.1.2 When tape reader stops, verify DSKY Row 1 displays +00008.

6.3.9.14.2 Start tape reader.

6.3.9.14.2.1 When tape reader stops, wait 20 seconds.

6.3.9.14.3 Test Initialization.

6.3.9.14.3.1 Start tape reader.

6.3.9.14.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	.07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.14.4 Horizontal Drift Test

6.3.9.14.4.1 Start tape reader.

6.3.9.14.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish

6.3.9.14.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.14.5 Test Termination.

6.3.9.14.5.1 Start tape reader.

6.3.9.14.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.15 Test Position +00009.

6.3.9.15.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.15.1.1 Start tape reader.

6.3.9.15.1.2 When tape reader stops, verify DSKY Row 1 displays +00009.

6.3.9.15.2 Start tape reader.

6.3.9.15.2.1 When tape reader stops, wait 20 seconds.

6.3.9.15.3 Test Initialization.

6.3.9.15.3.1 Start tape reader.

6.3.9.15.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.15.4 Horizontal Drift Test.

6.3.9.15.4.1 Start tape reader.

6.3.9.15.4.2 When tape reader stops, verify DSKY blanks except for PROG indicacation of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.15.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.15.5 Test Termination

6.3.9.15.5.1 Start tape reader.

6.3.9.15.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.16 Test Position +00010.

6.3.9.16.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.16.1.1 Start tape reader.

6.3.9.16.1.2 When tape reader stops, verify DSKY Row 1 displays +00010.

6.3.9.16.2 Start tape reader.

6.3.9.16.2.1 When tape reader stops, wait 20 seconds.

6.3.9.16.3 Test Initialization.

6.3.9.16.3.1 Start tape reader.

6.3.9.16.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.16.4 Horizontal Drift Test.

6.3.9.16.4.1 Start tape reader.

6.3.9.16.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.16.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.16.5 Test Termination.

6.3.9.16.5.1 Start tape reader.

6.3.9.16.5.2 When tape reader stops, wait 10 seconds before continuing:

6.3.9.17 Test Position +00011.

6.3.9.17.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.17.1.1 Start tape reader.

6.3.9.17.1.2 When tape reader stops, verify DSKY Row 1 displays +00011.

6.3.9.17.2 Start tape reader.

6.3.9.17.2.1 When tape reader stops, wait 20 seconds.

6.3.9.17.3 Test Initialization.

6.3.9.17.3.1 Start tape reader.

6.3.9.17.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24 · · ·	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.17.4 Horizontal Drift Test.

6.3.9.17.4.1 Start tape reader.

6.3.9.17.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.17.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.17.5 PIPA Scale Factor Test.

6.3.9.17.5.1 Start tape reader.

6.3.9.17.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.3.9.17.6 Test Termination.

6.3.9.17.6.1 Start tape reader.

6.3.9.17.6.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.18 Test Position +00012.

6.3.9.18.1 E-Memory Program and Test Position Matrix Sum Check

6.3.9.18.1.1 Start tape reader.

6.3.9.18.1.2 When tape reader stops, verify DSKY Row 1 displays +00012.

6.3.9.18.2 Start tape reader.

6.3.9.18.2.1 When tape reader stops, wait 20 seconds.

6.3.9.18.3 Test Initialization.

6.3.9.18.3.1 Start tape reader.

6.3.9.18.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

6.3.9.18.3.2 (continued)	If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.18.4 Horizontal Drift Test.

6.3.9.18.4.1 Start tape reader.

6.3.9.18.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.18.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.18.5 PIPA Scale Factor Test.

6.3.9.18.5.1 Start tape reader.

6.3.9.18.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXX. and .XXXXX cm/sec/sec).

6.3.9.18.6 Test Termination.

6.3.9.18.6.1 Start tape reader.

6.3.9.18.6.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.19 Test Position +00013.

6.3.9.19.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.19.1.1 Start tape reader.

6.3.9.19.1.2 When tape reader stops, verify DSKY Row 1 displays +00013.

6.3.9.19.2 Start tape reader.

6.3.9.19.2.1 When tape reader stops, wait 20 seconds.

6.3.9.19.3 Test Initialization.

6.3.9.19.3.1 Start tape reader.

6.3.9.19.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.19.4 Horizontal Drift Test.

6.3.9.19.4.1 Start tape reader.

6.3.9.19.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.19.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.19.5 Test Termination.

6.3.9.19.5.1 Start tape reader.

6.3.9.19.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.20 On CRT, record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.3.9.21 On K-148, enter the following sequence:

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

6.3.9.22 Calculations.

NOTE: Use Post Vibration or System Test data points only.

6.3.9.22.1 Y PIPA Data Correction Calculation.

6.3.9.22.1.1 From the uplink file tape, the compressed data tape or the PCM tape, request a data reduction of the X and Z accelerometer ΔV counts (addresses 37 and 41, respectively) and the TIME 2 and TIME 1 registers (addresses 24 and 25, respectively) for the period during which the Y PIPA test was being performed in Positions 5 and 6 of the IMU Performance Test.

6.3.9.22.1.2 Perform the following calculations for Position 5.

$$G'_5 = (G_5/\cos \theta y_5)$$

where:

G_5 = Measured acceleration term (line 1)

G'_5 = Corrected acceleration term (corrected value for line 1)

$\cos \theta y_5 = 1 - (\theta^2 y_5/2)$ for small angles

$$\theta y_5 = \sqrt{\theta^2{}_{x5} + \theta^2{}_{z5}}$$

and:

$$\theta_{z5} = (\Delta V_{x5} - \Delta V_x \text{ Bias})(\text{S.F.}_x)/(\Delta T)(\text{local g})$$

$$\theta_{x5} = (\Delta V_{z5} - \Delta V_z \text{ Bias})(\text{S.F.}_z)/(\Delta T)(\text{local g})$$

and:

$$\Delta V_x \text{ Bias} = (\text{X PIPA Bias})(\Delta T)/\text{S.F.}_x$$

$$\Delta V_z \text{ Bias} = (\text{Z PIPA Bias})(\Delta T)/\text{S.F.}_z$$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.3.9.22.1.3 Perform the following calculations for Position 6.

$$G'_6 = (G_6/\mathrm{Cos}\ \theta y_6)$$

where:

G_6 = Measured acceleration term (line j)

G'_6 = Corrected acceleration term (corrected value for line j)

$\mathrm{Cos}\ \theta y_6 = 1 - (\theta^2 y_6/2)$ for small angles

$$\theta y_6 = \sqrt{\theta^2{}_{x6} + \theta^2{}_{z6}}$$

and:

$\theta_{z6} = (\Delta V_{x6} - \Delta V_x\ \mathrm{Bias})\ (\mathrm{S.F.}_x)\ /\ (\Delta T)\ (\mathrm{local}\ g)$

$\theta_{x6} = (\Delta V_{z6} - \Delta V_z\ \mathrm{Bias})\ (\mathrm{S.F.}_z)\ /\ (\Delta T)\ (\mathrm{local}\ g)$

and:

ΔV_x Bias = (X PIPA Bias) $(\Delta T)/\mathrm{S.F.}_x$

ΔV_z Bias = (Z PIPA Bias) $(\Delta T)/\mathrm{S.F.}_z$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.3.9.22.2 Obtain data from last IRIG and/or PIPA Test and fill in Data Sheet x_{i-1}.

6.3.9.22.3 Obtain data from second last IRIG and/or PIPA Test and fill in Data Sheet x_{i-2}.

6.3.9.22.4 Obtain data from third last IRIG and/or PIPA Test and fill in Data Sheet x_{i-3}.

6.3.9.22.5 Perform the following calculations for each item appearing on Data Sheet x_i.

NOTE: See Paragraph 5.7 before continuing.

$$D_1 = \left| x_{i-1} - x_i \right|$$

$$D_2 = \left| x_{i-1} - x_i \right| + \left| x_{i-2} - x_{i-1} \right|$$

$$D_3 = \left| x_{i-3} - x_{i-2} \right| + \left| x_{i-2} - x_{i-1} \right| + \left| x_{i-1} - x_i \right|$$

DATA SHEET

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.3.9. 7.4.3	+N BDY - ADOAY Position +00001	meru/g	( )___.__	a
6.3.9. 8.4.3	+N BDZ - ADOAZ Position +00002	meru/g	( )___.__	b
6.3.9. 8.5.2	-X PIPA Test Position +00002	cm/sec^2	( ) 0 0___. ( )_____	c
6.3.9. 8.6.2	-N BDX + ADIAX Position +00002	meru/g	( )___.__	d
6.3.9. 9.4.3	+N BDX - ADOAX Position +00003	meru/g	( )___.__	e
6.3.9. 10.4.3	+N BDY + ADSRAY Position +00004	meru/g	( )___.__	f
6.3.9. 10.5.2	-Z PIPA Test Position +00004	cm/sec^2	( ) 0 0___. ( )_____	g
6.3.9. 10.6.2	+N BDZ + ADIAZ Position +00004	meru/g	( )___.__	h
6.3.9. 11.4.3	+Y PIPA Test Position +00005	cm/sec^2	( ) 0 0___. ( )_____	i

DATA SHEET (continued)

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.3.9. 12.4.3	-Y PIPA Test Position +00006	cm/sec^2	( ) 0 0 ___ . ( ) _____	j
6.3.9. 13.4.3	-NBDX + .707 (ADSRAX - ADOAX) Position +00007	meru/g	( ) ___ . __	k
6.3.9. 14.4.3	-.707 (NBDZ+NBDY) +0.5 (ADIAZ-ADIAY) +0.5 (ADSRAY + ADSRAZ) Position +00008	meru/g	( ) ___ . __	l
6.3.9. 15.4.3	-NBDZ + .707 (ADSRAZ-ADOAZ) Position +00009	meru/g	( ) ___ . __	m
6.3.9. 16.4.3	.707 (NBDY-NBDX) +0.5 (ADIAY-ADIAX) +0.5 (ADSRAX) + 0.5 (ADOAY) Position +00010	meru/g	( ) ___ . __	n
6.3.9. 17.4.3	-NDBX - ADOAX Position +00011	meru/g	( ) ___ . __	o
6.3.9. 17.5.2	+Z PIPA Test Position +00011	cm/sec^2	( ) 0 0 ___ . ( ) _____	p
6.3.9. 18.4.3	+NBDY + ADOAY Position +00012	meru/g	( ) ___ . __	q
6.3.9. 18.5.2	+X PIPA Test Position +00012	cm/sec^2	( ) 0 0 ___ . ( ) _____	r
6.3.9. 19.4.3	+NBDZ + ADOAZ Position +00013	meru/g	( ) ___ . __	s

DATA SHEET

CALCULATION	PARAMETER	UNITS	
$\frac{\text{line a + line q}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDY - ADOAY + NBDY + ADOAY}}{2}$ Transfer result to line ao	NBDY	meru	t
$\frac{\text{line q - line a}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDY + ADOAY - (NBDY - ADOAY)}}{2}$	ADOAY	meru/g	u
$\frac{\text{line b + line s}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDZ - ADOAZ + NBDZ + ADOAZ}}{2}$ Transfer result to line ap	NBDZ	meru	v
$\frac{\text{line s - line b}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDZ + ADOAZ - (NBDZ - ADOAZ)}}{2}$	ADOAZ	meru/g	w
$\frac{\text{line e - line o}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDX - ADOAX - (-NBDX - ADOAX)}}{2}$ Transfer result to line aq	NBDX	meru	x
$\frac{\text{line e + line o}}{2} \times (-1) = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDX - ADOAX - NBDX - ADOAX}}{2} \times (-1)$	ADOAX	meru/g	y

DATA SHEET (continued)

CALCULATION	PARAMETER	UNITS	
line d + line x = ( ) ___.__ (-NBDX + ADIAX) + NBDX Transfer result to line au	ADIAX	meru/g	z
line f - line t = ( ) ___.__ (+NBDY + ADSRAY) - NBDY Transfer result to line ar	ADSRAY	meru/g	aa
line h - line v = ( ) ___.__ (+NBDZ + ADIAZ) - NBDZ Transfer result to line av	ADIAZ	meru/g	ab
[line k + line x + .707 line y] x 1.414 [-NBDX + .707 ADSRAX -.707 ADOAX + NBDX + .707 ADOAX] x 1.414 Transfer results to line at	ADSRAX	meru/g	ac
(line m + line v + line w) x 1.414 [-NBDZ + .707(ADSRAZ-ADOAZ) + NBDZ + .707 ADOAZ] x 1.414 Transfer results to line as	ADSRAZ	meru/g	ad
(line n - .707 line t + .707 line x + 0.5 line z - 0.5 line ac - 0.5 line u) x 2 [.707(NBDY-NBDX) + 0.5(ADIAY-ADIAX) +0.5 ADSRAX + 0.5 ADOAY -.707 NBDY + .707 NBDX + 0.5 ADIAX -0.5 ADSRAX - 0.5 ADOAY] x 2 Transfer results to line aw.	ADIAY	meru/g	ae
line r - line c = ( )	PIPA X2G	cm/sec^2	af
line i - line j = ( )	PIPA Y2G	cm/sec^2	ag
line p - line g = ( )	PIPA Z2G	cm/sec^2	ah

DATA SHEET (continued)

CALCULATION	PARAMETER	UNITS	
1958.48 — line af x 1 cm/sec pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ax.	X PIPA S. F.	cm/sec/ pulse	ai
1958.48 — line ag x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ay.	Y PIPA S. F.	cm/sec/ pulse	aj
1958.48 — line ah x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer to line az.	Z PIPA S. F.	cm/sec pulse	ak
1/2 (line r + line c) = ( ) __ . ___ Transfer results to line ba.	X PIPA Bias	cm/sec^2	al
1/2 (line i + line j) = ( ) __ . ___ Transfer results to line bb.	Y PIPA Bias	cm/sec^2	am
1/2 (line p + line g) = ( ) __ . ___ Transfer results to line bc.	Z PIPA Bias	cm/sec^2	an

DATA SHEET (x_i)

PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
NBDY	meru	-15		+15			ao
NBDZ	meru	-15		+15			ap
NBDX	meru	-15		+15			aq
ADSRAY	meru/g	-40		+40			ar
ADSRAZ	meru/g	-40		+40			as
ADSRAX	meru/g	-40		+40			at
ADIAX	meru/g	-100		+100			au
ADIAZ	meru/g	-100		+100			av
ADIAY	meru/g	-100		+100			aw
X PIPA S.F.error from line ai	PPM	-1900		+1900			ax
Y PIPA S.F.error from line aj	PPM	-1900		+1900			ay
Z PIPA S.F.error from line ak	PPM	-1900		+1900			az
X PIPA Bias from line al	cm/sec^2	-3.1		+3.1			ba
Y PIPA Bias from line am	cm/sec^2	-3.1		+3.1			bb
Z PIPA Bias from line an	cm/sec^2	-3.1		+3.1			bc

DATA SHEET (x_{1-1})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET (x_1-2)

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S.F. error	PPM	
Y PIPA S.F. error	PPM	
Z PIPA S.F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET (x_{1-3})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET

PARAMETER	UNITS	D_1	MAX	D_2	MAX	D_3	MAX
NBDY	meru		6.0		9.0		11.0
NBDZ	meru		6.0		9.0		11.0
NBDX	meru		6.0		9.0		11.0
ADSRAY	meru/g		14.0		21.0		25.0
ADSRAZ	meru/g		14.0		21.0		25.0
ADSRAX	meru/g		14.0		21.0		25.0
ADIAX	meru/g		17.0		33.0		40.0
ADIAZ	meru/g		17.0		33.0		40.0
ADIAY	meru/g		17.0		33.0		40.0
X PIPA S.F. error	PPM		400		500		600
Y PIPA S.F. error	PPM		400		500		600
Z PIPA S.F. error	PPM		400		500		600
X PIPA Bias	cm/sec^2		0.50		0.70		0.90
Y PIPA Bias	cm/sec^2		0.50		0.70		0.90
Z PIPA Bias	cm/sec^2		0.50		0.70		0.90

6.3.10 LGC Voltage Margin Test

6.3.10.1 Initial Conditions

6.3.10.1.1 Insure that the G&N System is in the Standby Mode.

6.3.10.1.2 On the CRT, verify the +28 VDC LGC OPERATE bus is between 24.5 and 33.5 vdc (GG 1520).

6.3.10.1.3 On Panel 5, set lighting override ANUN SW to ON. Rotate the ANUN/NUM dimmer fully CCW.

6.3.10.2 Voltage Fail Determination

CAUTION: The +4 VDC LGC supply voltage shall never be operated lower than +2.5 vdc or higher than +5.2 vdc (GG 1030).

The +14 VDC LGC supply shall never be operated at less than +8.5 vdc or higher than +17.0 vdc (GG 1020).

NOTE: The flashing indication of the LGC supplies may be disregarded for this test.

6.3.10.2.1 Enter in C-156, +020041124. Verify the +4 VDC supply is 4.0±0.22 vdc, and execute.

6.3.10.2.2 Enter in C-156, +025141114. Verify the +14 VDC supply is 14.0±0.5 vdc, and execute.

6.3.10.2.3 Enter 0001 into R-155, Verify and execute.

6.3.10.2.4 Enter in C-156, ±XX.X141114. (Enter values for XX.X in incremental steps to lower the +14 VDC to cause an LGC Restart.) Execute.

6.3.10.2.5 Press the MARK X pushbutton on the occurrence of Master Alarm activation.

6.3.10.2.5.1 Verify the RESTART light on the DSKY is on and the LGC Warning light on the CAUTION/WARNING panel is on.

6.3.10.2.5.2 On the G/N panel press the MASTER ALARM pushbutton to reset.

6.3.10.2.6 On the PSA Adapter Module (PSAAM) (410-31080), place the INHIBIT VOLTAGE FAIL switch to ON.

6.3.10.2.7 Verify the LGC Warning light is off.

6.3.10.2.8 On the CRT, verify the +14 VDC LGC supply (GG 1020) is between 12.1 and 12.8 vdc.

6.3.10.2.9 Record the final C-START setting.

6.3.10.2.10 Enter in C-156, +02514114. Verify the +14 VDC supply is 14.0±0.5 vdc, and execute.

6.3.10.2.11 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to OFF.

6.3.10.2.12 On the DSKY, press the Error Reset (RSET) pushbutton.

6.3.10.2.12.1 Verify the RESTART light is off.

6.3.10.2.13 Enter in C-156, ±XX.X141114. (Enter values for XX.X in incremental steps to raise the +14 VDC to cause an LGC Restart.) Execute.

6.3.10.2.14 Press the MARK X pushbutton on the occurrence of Master Alarm activation.

6.3.10.2.14.1 Verify the RESTART light on the DSKY is on and the LGC Warning light on the CAUTION/WARNING panel is on.

6.3.10.2.14.2 On the G&N panel press the MASTER ALARM pushbutton to reset.

6.3.10.2.15 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to ON.

6.3.10.2.16 Verify the LGC Warning light is off.

6.3.10.2.17 On the CRT, verify the +14 VDC LGC supply (GG 1020) is between 15.6 and 16.5 vdc.

6.3.10.2.18 Record the final C-START setting.

6.3.10.2.19 Enter in C-156, +025141114. Verify the +14 VDC supply is 14.0± 0.5 vdc, and execute.

6.3.10.2.20 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to OFF.

6.3.10.2.21 On the DSKY press the Error Reset (RSET) pushbutton.

6.3.10.2.21.1 Verify the RESTART light is off.

6.3.10.2.22 Enter in C-156, ±XX.X041124. (Enter values for XX.X in incremental steps to lower the +4 VDC supply to cause an LGC Restart.) Verify and execute.

6.3.10.2.23 Press the MARK X pushbutton on the occurrence of Master Alarm activation.

6.3.10.2.23.1 Verify on the DSKY that the RESTART light is on and on the CAUTION/WARNING panel the LGC Warning light is on..

6.3.10.2.23.2 On the G&N panel press the MASTER ALARM pushbutton to reset.

6.3.10.2.24 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to ON.

6.3.10.2.25 Verify the LGC Warning light is off.

6.3.10.2.26 On the CRT, verify the +4 VDC LGC supply (GG 1030) is between 3.8 and 3.4 vdc.

6.3.10.2.27 Record the final C-START setting.

6.3.10.2.28 Enter in C-156, +020041124. Verify the +4 VDC LGC supply is 4.0± 0.22 vdc, and execute.

6.3.10.2.29 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to OFF.

6.3.10.2.30 On the DSKY press the Error Reset (RSET) pushbutton.

6.3.10.2.30.1 Verify the RESTART light is off.

6.3.10.2.31 Enter in C-156±XX.X041124. (Enter values for XX.X in incremental steps to raise the +4 VDC supply to cause an LGC Restart.) Verify and execute.

6.3.10.2.32 Press the MARK X pushbutton on the occurrence of Master Alarm activation.

6.3.10.2.32.1 On the DSKY, verify that the RESTART light is on and on the CAUTION/WARNING panel the LGC Warning light is on.

6.3.10.2.32.2 On the G&N panel press the MASTER ALARM pushbutton to reset.

6.3.10.2.33 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to ON.

6.3.10.2.34 Verify the LGC Warning light is off.

6.3.10.2.35 On the CRT verify the +4 VDC LGC supply (GG 1030) is between 4.2 and 4.7 vdc.

6.3.10.2.36 Record the final C-START setting.

6.3.10.2.37 Enter in C-156, +020041124. Verify the +4 VDC supply is 4.0± 0.22 vdc, and execute.

6.3.10.2.38 On the DSKY press the Error Reset (RSET) pushbutton.

6.3.10.2.38.1 Verify the RESTART light is off.

6.3.10.3 Voltage Margin Determination

6.3.10.3.1 Verify the appropriate K-START tape for LM Self-Check Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.10.3.2 Start the tape reader.

6.3.10.3.3 When the tape reader stops, verify:

R1 = +YYYYY (The value YYYYY is flight Rope dependent and
is found in Appendix II)
R2 = +10538 (tape number)
R3 = -000XX (tape revision number)

6.3.10.3.4 Load E-Memory Program

6.3.10.3.4.1 Start tape reader.

6.3.10.3.4.2 When the tape reader stops, verify:

R1 = 00101.

6.3.10.3.5 Initiate Self-Check

6.3.10.3.5.1 Start the tape reader.

6.3.10.3.5.2 Verify that neither the RESTART nor PROG lights are lit.

6.3.10.3.6 Enter in C-156, ±XX.X141114. (Enter values for XX.X in incremental steps to attain a value for the +14 VDC LGC supply of 12.1 (+0.1, -0.0) vdc). Verify and execute.

6.3.10.3.7 Record the final C-START setting.

6.3.10.3.8 Enter in C-156, ±XX.X041124. (Enter values for XX.X in incremental steps to attain a value for the +4 VDC LGC supply of 3.4 (+0.1, -0.0) vdc). Verify and execute.

6.3.10.3.9 Record the final C-START setting.

6.3.10.3.10 Verify that R2 increments by 2 and that the PROG Caution light is off.

6.3.10.3.11 Enter in C-156, ±XX.X141114. (Enter values for XX.X in incremental steps to attain a value for the +14 VDC LGC supply of 16.4 (+0.1, -0.0) vdc). Verify and execute.

6.3.10.3.12 Record the final C-START setting.

6.3.10.3.13 Verify that R2 increments by 2 and the PROG Caution light is off.

6.3.10.3.14 Enter in C-156, ±XX.X041124. (Enter values for XX.X in incremental steps to attain a value for the +4 VDC LGC supply of 4.5(+0.1, -0.0) vdc). Verify and execute.

6.3.10.3.15 Record the final C-START setting.

6.3.10.3.16 Verify that R2 increments by 2 and the PROG Caution light is off.

6.3.10.3.17 Enter in C-156, ±XX.X141114. (Enter values for XX.X in incremental steps to attain a value for the +14 VDC LGC supply of 12.1 (+0.1, -0.0) vdc). Verify and execute.

6.3.10.3.18 Record the final C-START setting.

6.3.10.3.19 Verify that R2 increments by 2 and that the PROG Caution light is off.

6.3.10.3.20 Enter in C-156, +0251411114. Verify and execute.

6.3.10.3.21 Enter in C-156, +0200411124. Verify and execute.

6.3.10.3.22 Enter 0000 into R-155.

6.3.10.3.23 Enter in C-156, +000001114. Verify and execute.

6.3.10.3.24 Enter in C-156, +000001124. Verify and execute.

6.3.10.3.25 On the CRT, verify the +14 VDC supply is 14.0± 0.5 vdc, and the +4 VDC supply is 4.0± 0.22 vdc.

6.3.10.3.26 Start the tape reader (wait 30 seconds).

6.3.10.3.27 On the DSKY, key RSET (Error Reset).

6.3.10.3.28 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to OFF.

6.3.10.3.29 On Panel 5, set the override ANUN SW to OFF. Adjust the ANUN/NUM dimmer.

6.3.10.3.30 Key in the following:

VERB 36 ENTR

6.3.11 LGC Clock Frequency Test

6.3.11.1 Insure that LGC Operate power has been applied for a minimum of 10 minutes.

6.3.11.2 Verify that the counter is connected to the 3.2 kc signal on the hardline.

6.3.11.3 Obtain a 30 second sample of clock frequency.

6.3.11.4 Repeat 6.3.11.3 nine times.

6.3.11.5 The average of the 10 previous readings shall be 30.000000±0.000060 seconds.

6.3.11.6 Insure that the System is not in IMU Operate.

6.3.11.7 Enter the following on K-148:

VERB 37 ENTR
06 ENTR
VERB 50 NOUN 25 shall flash
Row 1 = 00062

Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the STBY lamp is lit.

6.3.11.8 Repeat steps 6.3.11.3 and 6.3.11.4.

6.3.11.9 Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the STBY lamp is not lit. Restart lamp may be on. VERB 37 shall flash on the DSKY. Enter VERB 36 ENTR on DSKY. Wait 10 seconds.

6.3.11.10 MARK X Pushbutton Test.

6.3.11.10.1 On the Computer Control and Reticle Dimmer assembly, press and hold MARK X pushbutton.

6.3.11.10.2 On K-148 enter the following:

VERB 05 NOUN 09 ENTR

On the DSKY observe:

Row 1 = 00112
PROG alarm lamp is lit

Press ERR RSET.

6.3.11.10.3 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.10.4 Observe that DSKY Row 1 displays 00004.

6.3.11.10.5 Release MARK X pushbutton.

6.3.11.10.6 Observe that DSKY Row 1 displays 00000.

6.3.11.11 MARK Y Pushbutton Test

6.3.11.11.1 Press and hold the MARK Y Pushbutton on the Computer Control and Reticle Dimmer Assembly.

6.3.11.11.2 On K-148 enter the following:

VERB 05 NOUN 09 ENTR

On the DSKY observe:

Row 1 = 00112
PROG alarm lamp is lit

Press ERR RSET.

6.3.11.11.3 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.11.4 Observe that DSKY Row 1 displays 00010.

6.3.11.11.5 Release the MARK Y pushbutton.

6.3.11.11.6 Observe that DSKY Row 1 displays 00000.

6.3.11.12 REJECT Pushbutton Test

6.3.11.12.1 Press and hold the REJECT pushbutton on the Computer Control and Reticle Dimmer assembly.

6.3.11.12.2 On CRT verify FAILREG = 00112

PROG alarm lamp is lit

Press ERR RSET.

6.3.11.12.3 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.12.4 Observe that DSKY Row 1 displays 00020.

6.3.11.12.5 Release the REJECT pushbutton.

6.3.11.12.6 Observe that DSKY Row 1 displays 00000.

6.3.11.13 Reticle Brightness Control Test

6.3.11.13.1 On the DSKY perform the following operation:

VERB 36 ENTR

6.3.11.13.2 On panel 11 close PGNS AOT lamp circuit breaker. On the Computer Control and Reticle Dimmer assembly, rotate the RETICLE BRIGHTNESS control to its minimum light intensity position. View through the AOT and verify that the Reticle lamp is off.

6.3.11.13.3 While viewing through the AOT, slowly rotate the RETICLE BRIGHTNESS control to increase the reticle brightness until a stop is reached. Observe that the reticle brightness has increased in intensity. Return RETICLE BRIGHTNESS control to off state. On panel 11 open PGNS AOT lamp circuit breaker.

6.3.11.14 AOT Eyepiece Heater Test.

6.3.11.14.1 Secure milliammeter HP 428B and current probe HP 428A-21A.

6.3.11.14.2 Locate P1 at Computer Control and Reticle Dimmer assembly. Push lacing cord away from P1 back to fifth tie point.

6.3.11.14.3 Clip current probe HP 428A-21A to blue wire in cable with red arrow pointing away from P1. Measure and record current indication. The current shall be between 139 and 244 ma.

6.3.11.14.4 Remove current probe, push lacing cord back to P1 and spot tie.

6.3.12 Gimbal Friction Test

6.3.12.1 Inner Gimbal Friction Test.

6.3.12.1.1 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.1.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00150).

6.3.12.1.3 Set up Analog Recorder to monitor the following signals.

Meas. No.	Signal Name
a. GG 2110	IG Torque Motor Current
b. GG 2106	IG Servo Error Total
c. GG 2107	IG Servo Error In Phase
d. GG 2112	IG 1X Resolver Sine
e. GG 2113	IG 1X Resolver Cosine
f. GG 2220	IG CDU Fine Error
g. GG 1201	IMU 28V 1% 800 CPS
h. GG 2221	IG CDU Coarse Error

6.3.12.1.4 Set up Analog Recorder to monitor the following signals:

Meas. No.	Signal Name
GG 2300	PIPA TEMP
GG 1520	+28 VDC LGC OPR BUS

6.3.12.1.5 After 10 seconds has elapsed since Step 6.3.12.1.1, enter the following into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR (OGC)
00000 ENTR

6.3.12.1.6 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.1.7 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
37777 ENTR ENTR
37743 ENTR ENTR
00000 ENTR ENTR
00000 ENTR (once)

6.3.12.1.8 IG -360° TORQUE

6.3.12.1.9 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.1.10 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.1.11 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTER Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR

6.3.12.1.11 (Continued)

+27000	ENTR
Wait 15 seconds	
VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR

6.3.12.1.12 On the CRT, verify CDU X, CDU Y, CDU Z all indicate +00000 (±00150).

6.3.12.1.13 After 10 seconds has elapsed since Step 6.3.12.1.11, enter the following sequence into K-148:

VERB 21 NOUN 01	ENTR
02737	ENTR
00000	ENTR

6.3.12.1.14 Verify on CRT, DSKY display.

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.1.15 On K-148 enter the following sequence:

NOUN 15	ENTR
00000	ENTR ENTR
40000	ENTR ENTR
40034	ENTR ENTR
00000	ENTR ENTR
00000	ENTR (once)
40034	ENTR ENTR
Verify R1 = 40034	
00000	ENTR ENTR
Verify R1 = 00000	
00000	ENTR (once)
Verify R1 = 00000	

6.3.12.1.16 IG +360° TORQUE

6.3.12.1.17 On K-148 enter the following sequence

VERB 42	ENTR
VERB 33	ENTR

6.3.12.1.18 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.2 Outer Gimbal Friction Test

6.3.12.2.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.2.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00150).

6.3.12.2.3 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2167	OG Servo Error In Phase
b. GG 2170	OG Torque Motor Current
c. GG 2166	OG Servo Error Total
d. GG 2280	OG CDU Fine Error
e. GG 2172	OG 1X Resolver Sine
f. GG 2173	OG 1X Resolver Cosine
g. GG 2281	OG CDU Coarse Error

6.3.12.2.4 After 10 seconds has elapsed since Step 6.3.12.2.1, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
37777 ENTR

6.3.12.2.5 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 = 37777
R3 = 02737

6.3.12.2.6 On K-148, enter the following sequence:

NOUN 15 ENTR
37743 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR (once)

6.3.12.2.7 OG -360° TORQUE

6.3.12.2.8 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.2.9 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.2.10 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTER, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.2.11 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00150).

6.3.12.2.12 After 10 seconds has elapsed since Step 6.3.12.2.10, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
40000 ENTR

6.3.12.2.13 Verify on CRT, DSKY display:

VERB 21 NOUN 01
R1 = 40000
R3 = 02737

6.3.12.2.14 On K-148 enter the following sequence:

NOUN 15 ENTR
40034 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR

6.3.12.2.15 OG +360° TORQUE

6.3.12.2.16 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.2.17 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.3 Middle Gimbal Friction Test.

6.3.12.3.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds

6.3.12.3.1
(Continued)

VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+06750 ENTR

6.3.12.3.2 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00150, and CDU Z = +06750±00200.

6.3.12.3.3 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2136	MG Servo Error Total
b. GG 2137	MG Servo Error In Phase
c. GG 2140	MG Torque Motor Current
d. GG 2143	MG 1X Resolver Cosine
e. GG 2250	MG CDU Fine Error
f. GG 2142	MG 1X Resolver Sine
g. GG 2251	MG CDU Coarse Error

6.3.12.3.4 After 10 seconds have elapsed since Step 6.3.12.3.1, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.3.5 Verify on CRT, DSKY display:

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.3.6 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
14000 ENTR ENTR
00000 ENTR (once)

6.3.12.3.7 MG -135° TORQUE

6.3.12.3.8 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.3.9 Monitor analog recorder. When MG Torque Motor Current (GG 2140) drops to a quiescent level (approximately 6 minutes), stop the recorders.

6.3.12.3.10 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
-06750 ENTR

6.3.12.3.11 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00150, and CDU Z = -06750±00200.

6.3.12.3.12 After 10 seconds has elapsed since Step 6.3.12.3.10, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.3.13 On the CRT, verify DSKY display:

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.3.14 On K-148 enter the following sequence:

NOUN 15	ENTR
00000	ENTR ENTR
00000	ENTR ENTR
00000	ENTR ENTR
63777	ENTR ENTR
77777	ENTR (once)

6.3.12.3.15 MG +135° TORQUE

6.3.12.3.16 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.3.17 Monitor analog recorder. When the MG Torque Motor Current signal (GG 2140) drops to a quiescent level (approximately 6 minutes) stop the recorders.

6.3.12.3.18 On K-148 enter the following sequence:

VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR
Wait 15 seconds	
VERB 36	ENTR

6.3.12.4 Test Analysis.

6.3.12.4.1 Remove the strip charts from analog recorders.

6.3.12.4.2 Examine the traces of the recorded measurements for all six phases of this test to detect any sharp discontinuities. Disregard transients of 0.5 second duration or less on the Gimbal Torque Motor current traces and disregard all transients on the CDU Fine Error and CDU Coarse Error traces. The Gimbal Torque Motor currents shall not exceed 0.125 ampere. The CDU Fine Error measurements shall not exceed ±70 mv rms. The CDU Coarse Error measurement shall not exceed ±680 mv rms.

6.3.13 Stabilization Loop Step Response Test

6.3.13.1 IG Response Test

6.3.13.1.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.13.1.2 On CRT, verify IG MG, and OG gimbal angles are between 358 and 002.

6.3.13.1.3 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2106	IG Servo Error Total
b. GG 2107	IG Servo Error In Phase
c. GG 2110	IG Torque Motor Current
d. GG 2112	IG 1X Resolver Sine
e. GG 2113	IG 1X Resolver Cosine
f. GG 2220	IG CDU Fine Error
g. GG 1201	IMU 28V 1 PCT 800 CPS

6.3.13.1.4 On K-148 enter the following:

VERB 40 NOUN 20 ENTR, Wait 10 seconds

6.3.13.1.5 On the CRT verify CDU X, CDU Y AND CDU Z indicate +00000±00200.

CAUTION: If the transients caused by the subsequent step input do not settle within 15 seconds, remove IMU Operate Power.

6.3.13.1.6 Enter 1000 into R-155.

6.3.13.1.7 Press XEQ/SEAL pushbutton on R-155 to enter the DC step voltage into the IG stabilization loop.

6.3.13.1.8 Prepare to start analog recorder.

6.3.13.1.9 Enter 0000 into R-155. Start analog recorder. Press the XEQ/SEAL pushbutton to remove the step input to the IG stabilization loop.

6.3.13.1.10 After the transient on the recorder has settled, stop this recorder.

6.3.13.1.11 From the Servo Error In Phase signal recorder trace measure the time interval (T1, Fig. 2) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 2). The period T1, shall not exceed 0.1 second and the trace shall have no more than 3 overshoots.

6.3.13.2 MG Response Test

6.3.13.2.1 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2136	MG Servo Error Total
b. GG 2137	MG Servo Error In Phase
c. GG 2140	MG Torque Motor Current
d. GG 2142	MG 1X Resolver Sine
e. GG 2143	MG 1X Resolver Cosine
f. GG 2250	MG CDU Fine Error
g. GG 1201	IMU 28V 1% 800 cps

6.3.13.2.2 On the CRT, verify CDU X, CDU Y and CDU Z indicate +00000 (±00200).

CAUTION: If the transients caused by the subsequent step input do not settle within 15 seconds, remove IMU Operate Power.

6.3.13.2.3 Enter 0100 into R-155. Press XEQ/SEAL pushbutton R-155 to enter the DC step voltage into the MG stabilization loop.

6.3.13.2.4 Prepare to start analog recorder.

6.3.13.2.5 Enter 0000 into R-155. Start analog recorder. Press XEQ/SEAL pushbutton to remove the step input to the MG stabilization loop.

6.3.13.2.6 After the transient on the recorder has settled, stop the recorder.

6.3.13.2.7 From the Servo Error In Phase signal recorder trace measure the time interval (T1 Fig. 2) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 2). The period T1, shall not exceed 0.1 seconds and the trace shall have no more than 3 overshoots.

6.3.13.3 OG Response Test

6.3.13.3.1 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2166	OG Servo Error Total
b. GG 2167	OG Servo Error In Phase
c. GG 2170	OG Torque Motor Current

6.3.13.3.1 (Continued)

Meas. No.	Signal Name
d. GG 2172	OG 1X Resolver Sine
e. GG 2173	OG 1X Resolver Cosine
f. GG 2280	OG CDU Fine Error
g. GG 1201	IMU 28V 1% 800 cps

6.3.13.3.2 On the CRT, verify CDU X, CDU Y and CDU Z indicate +00000 (±00200).

CAUTION: If the transients caused by the subsequent step input do not settle within 15 seconds, remove IMU Operate Power.

6.3.13.3.3 Enter 0010 into R-155. Press XEQ/SEAL pushbutton on R-155 to enter the DC step voltage into the OG stabilization loop.

6.3.13.3.4 Prepare to start analog recorder.

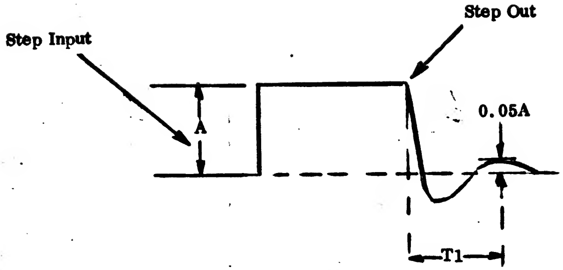
6.3.13.3.5 Enter 0000 into R-155. Start analog recorder. Press XEQ/SEAL pushbutton to remove the step input to the OG stabilization loop.

6.3.13.3.6 After the transient on the recorder has settled, stop the recorder.

6.3.13.3.7 From the Servo Error In Phase signal recorder trace, measure the time interval (T1, Fig. 2) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 2). The period, T1, shall not exceed 0.1 second and the trace shall have not more than 5 overshoots.

6.3.13.3.8 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR



TYPICAL STAB LOOP RESPONSE TO STEP INPUT

FIGURE 2

6.3.15 **AOT Functional Accuracy Test**

NOTE: Use of a Dioptometer is required when sighting through AOT. The included angles between target LOS shall be known to ± 10 arc-seconds. The elevation of each target LOS shall be known to ± 15 arc-seconds.

6.3.15.1 Insure that the G&N System is in the Operate Mode.

6.3.15.2 While viewing through the AOT, instruct a target operator to translate (vertically and laterally) and rotate (in azimuth and elevation) a target until the center of the reticle is visible in the Left and Forward detent AOT positions.

Note: Insure that the target remains stable during the following AOT readings.

6.3.15.3 Plate the AOT in the L detent position.

6.3.15.4 Rotate the AOT control knob until the center of the target reticle is superimposed between the double "Y" reticle. Read and record the dial indication as LY1 = ± XXX.XX.

6.3.15.4.1 Rotate the AOT control knob until the center of the target reticle is no longer superimposed between the double "Y" reticle.

6.3.15.4.2 Repeat the preceding two steps, 6.3.15.4 and 6.3.15.4.1, two more times and average the three results. Record the following:

LY2 = ± XXX.XX
LY3 = ± XXX.XX
LY(AVG) = ± XXX.XX

6.3.15.5 Rotate the AOT control knob until the center of the target reticle is superimposed between the double lines of the spiral reticle. Read and record the dial indication as LS1 = ± XXX.XX.

6.3.15.5.1 Rotate the AOT control knob until the center of the target reticle is no longer superimposed between the double lines of the spiral reticle.

6.3.15.5.2 Repeat the preceding two steps, 6.3.15.5 and 6.3.15.5.1, two more times and average the three results. Record the following:

6.3.15.5.2 -continued-

LS2 = ±XXX.XX
LS3 = ±XXX.XX
LS(AVG) = ±XXX.XX.

6.3.15.6 Rotate the AOT into the F detent position.

6.3.15.7 Rotate the AOT control knob until the center of the target reticle is superimposed between the double "Y" reticle. Read and record the dial indication as FY 1 = ±XXX.XX.

6.3.15.7.1 Rotate the AOT control knob until the center of the target reticle is no longer superimposed between the double "Y" reticle.

6.3.15.7.2 Repeat the preceding two steps, 6.3.15.7 and 6.3.15.7.1, two more times and average the three results. Record the following:

FY2 = ±XXX.XX
FY3 = ±XXX.XX
FY(AVG) = ±XXX.XX.

6.3.15.8 Rotate the AOT control knob until the center of the target reticle is superimposed between the double lines of the spiral reticle. Read and record the dial indications as FS1 = ±XXX.XX

6.3.15.8.1 Rotate the AOT control knob until the center of the target reticle is no longer superimposed between the double lines of the spiral reticle.

6.3.15.8.2 Repeat the preceding two steps, 6.3.15.8 and 6.3.15.8.1, two more times and average the three results. Record the following:

FS2 = ±XXX.XX
FS3 = ±XXX.XX
FS(AVG) = ±XXX.XX

6.3.15.9 AOT Angle Calculation

6.3.15.10 On K-148 enter the following sequence:

VERB	NOUN 20	ENTR
±XXXXX		ENTR (270° - S/C AZ)
+00000		ENTR
+02858		ENTR

Verify the NO ATT light is illuminated.

6.3.15.11 On K-148 enter the following sequence:

VERB 25	NOUN 07	ENTR
00104		ENTR
00200		ENTR
00001		ENTR

6.3.15.12 On K-148 enter the following detent calibration data:

VERB 21	NOUN 03	ENTR	
03404		ENTR	
±XXX.XX		ENTR ENTR	(L detent AZ)
03405		ENTR	
±XXX.XX		ENTR ENTR	(F detent AZ)
03406		ENTR	
±XXX.XX		ENTR ENTR	(R detent AZ)
03407		ENTR	
±XXX.XX		ENTR ENTR	(L detent EL)
03410		ENTR	
±XXX.XX		ENTR ENTR	(F detent EL)
03411		ENTR	
±XXX.XX		ENTR	(R detent EL)

6.3.15.13 On K-148 enter the following:

VERB 37	ENTR
00051	ENTR

Verify PROG is 51 on DSKY.

6.3.15.14 Verify VERB 50 NOUN 25 flashing and DSKY display should be:

R1 = 00015

6.3.15.15 On K-148 enter:

VERB 33	ENTR

6.3.15.16 Verify VERB 01 NOUN 71 flashing and DSKY display for R1 is:

R1 = 00CDE

C is the AOT detent code. D and E give the octal star code.

6.3.15.17 On K-148 enter the following sequence:

VERB 21	ENTR
00110	ENTR
VERB 33	ENTR

6.3.15.18 Verify VERB 54 NOUN 71 flashing and DSKY display:

R1 = 00110

6.3.15.19 On Computer Control and Reticle Dimming Assembly, press the MARK X pushbutton.

6.3.15.20 VERB 06 NOUN 79 shall flash and the DSKY shall display:

R1 = XXX.XX (Cursor Angle)
R2 = XXX.XX (Spiral Angle)
R3 = XXXXX (Position Code)

6.3.15.21 On K-148 enter the following:

VERB 25	ENTR
±XXX.XX	ENTR (LY(AVG) from 6.3.15.4.2)
±XXX.XX	ENTR (LS(AVG) from 6.3.15.5.2)
+00001	ENTR
VERB 33	ENTR

6.3.15.22 Verify that VERB 01 NOUN 71 flashes and R1 = 00110.

6.3.15.23 On K-148 enter the following:

VERB 21	ENTR
00210	ENTR
VERB 33	ENTR

6.3.15.24 VERB 54 NOUN 71 shall flash and R1 = 00210.

6.3.15.25 On Computer Control and Reticle Dimming Assembly, press the MARK X pushbutton.

6.3.15.26 Verify VERB 06 NOUN 79 flashing. The DSKY display shall be:

R1 = XXX.XX (Cursor Angle)
R2 = XXX.XX (Spiral Angle)
R3 = XXXXX (Position Code)

6.3.15.27 On K-148 enter the following sequence:

VERB 25	ENTR
±XXX.XX	ENTR (FY(AVG) from 6.3.15.7.2)
±XXX.XX	ENTR (FS(AVG) from 6.3.15.8.2)
+00002	ENTR
VERB 33	ENTR

6.3.15.28 When VERB 06 NOUN 05 flashes, record R1. R1 shall not exceed 0±.08°.

6.3.15.29 On K-148 enter the following:

VERB 36		ENTR
VERB 25	NOUN 07	ENTR
01303		ENTR
00040		ENTR
00001		ENTR

6.3.16 Flight Rope Fixed Memory Bank Sum Check

NOTE: Before proceeding with this test, obtain a Computer Program listing of the flight program being tested. Prepare a list of the bank CKSM bugger words.

6.3.16.1 Verify G&N System in Standby Mode.

6.3.16.2 On K-148 enter the following sequence:

Press ERR RSET
VERB 56 ENTR
Observe VERB 05 NOUN 01 flashing

6.3.16.3 Record the CRT DSKY display indications.

Row 1 = AAAAA	Bank Sum
Row 2 = 000BB	Bank Number
Row 3 = CCCCC	(Bank CKSM bugger word)

Row 1 shall be the same as or the complement of the number displayed in Row 2. Row 3 Indication shall be the same as the bugger word recorded above for the bank tested.

6.3.16.4 On K-148 enter VERB 33 ENTR

6.3.16.5 Repeat paragraphs 6.3.16.3 and 6.3.16.4 until all memory bank sums have been checked.

6.3.16.6 On K-148 enter VERB 34 ENTR.

6.3.17 RR/CDU Control Test

NOTE: RR CDU testing requires that the Rendezvous Radar is operating. The Rendezvous Radar is not activated until Integrated testing. To insure that the RR CDU's are operating properly the minimum requirements for RR CDU testing are presented here so that they may be included as part of the requirements to be demonstrated at the first opportunity after Rendezvous Radar activation.

6.3.17.1 Initialization

6.3.17.1.1 On K-148 enter the following:

VERB 36	ENTR, Wait 10 seconds
VERB 41 NOUN 72	ENTR
+04500	ENTR
+04500	ENTR
Wait 10 seconds	
VERB 41 NOUN 72	ENTR
+00000	ENTR
+00000	ENTR

VERB 04 NOUN 06 shall flash.
Verify Row 2 = 00002

If Row 2 display is correct proceed to next step. If it is not correct, enter the following on K-148:

VERB 22	ENTR
00002	ENTR

6.3.17.1.2 On K-148 enter the following:

VERB 33	ENTR

Wait 25 seconds before continuing.

6.3.17.2 CDU Fine and CDU Coarse Error

6.3.17.2.1 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 3311	Shaft CDU Fine Error
b. GG 3312	Shaft CDU Coarse Error
c. GG 3321	Trunnion CDU Fine Error
d. GG 3322	Trunnion CDU Coarse Error

6.3.17.2.2 On K-148 enter the following:

VERB 36 ENTR, Wait 10 seconds
VERB 41 NOUN 72 ENTR
+04500 ENTR
+04500 ENTR
VERB 04 NOUN 06 shall flash.
Verify Row 2 = 00002
VERB 33 ENTR

Wait 10 seconds. Verify on CRT that RR CDU Trunnion and Shaft angles indicate 045.00±000.30 deg.

6.3.17.2.3 Verify the following signals on the CRT:

RR Shaft 1X Sine (GG 3304)	18.4±1.84 VRMS
RR Shaft 1X Cos (GG 3305)	18.4±1.84 VRMS
RR Trunnion 1X Sine (GG 3324)	18.4±1.84 VRMS
RR Trunnion 1X Cos (GG 3325)	18.4±1.84 VRMS

6.3.17.2.4 Verify CDU Fine Errors (GG 3311, GG 3321) do not exceed 0.07 volts.

6.3.17.2.5 Verify CDU Coarse Errors (GG 3312, GG 3322) do not exceed 0.680 volts.

6.3.17.3 RR CDU Fail.

6.3.17.3.1 On K-148 enter the following:

VERB 36 ENTR, Wait 10 seconds
VERB 41 NOUN 72 ENTR
+00100 ENTR
+00000 ENTR
VERB 04 NOUN 06 shall flash
Verify Row 2 = 00002
VERB 33 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00001 ENTR

Verify RR CDU Fail and Tracker Alarm come ON in approximately 10 seconds.

6.3.17.3.2 Press ERR RSET
VERB 36 ENTR, Wait 10 seconds
VERB 41 NOUN 72 ENTR
+00000 ENTR
+00000 ENTR
VERB 44 ENTR

6.3.17.3.2 (Continued)

+00100 ENTR
VERB 04 NOUN 06 shall flash
Verify Row 2 = 00002
VERB 33 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00001 ENTR

Verify RR CDU Fail and Tracker Alarm come ON in approximately 10 seconds.

6.3.17.3.3 On K-148 enter the following:

Press ERR RSET
VERB 36 ENTR, Wait 10 seconds
VERB 41 NOUN 72 ENTR
+03375 ENTR
+00000 ENTR
VERB 04 NOUN 06 shall flash
Verify Row 2 = 00002
VERB 33 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00001 ENTR

Verify RR CDU Fail and Tracker Alarm come ON in approximately 10 seconds.

6.3.17.3.4 On K-148 enter the following:

Press ERR RSET
VERB 36 ENTR, Wait 10 seconds
VERB 41 NOUN 72 ENTR
+00000 ENTR
+03375 ENTR
VERB 04 NOUN 06 shall flash
Verify Row 2 = 00002
VERB 33 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00001 ENTR

Verify RR CDU Fail and Tracker Alarm come ON in approximately 10 seconds.

6.3.17.3.5 On K-148 enter the following:

Press ERR RSET
VERB 44 ENTR
VERB 41 NOUN 72 ENTR
+00000 ENTR
+00000 ENTR
VERB 44 ENTR

APPENDIX I

MEASUREMENT TOLERANCES

Signal	Link	Signal Name	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
GG 1020	4*	+14 vdc LGC Supply	14.0±0.4 vdc	0%
GG 1030	4	+4 vdc LGC Supply	4.0±0.2 vdc	0%
GG 1040	5**	+120 vdc PIPA Supply	120±6.0 vdc	1%
GG 1070	4	+4 vdc CDU Supply	4.0±0.2 vdc	0%
GG 1100	4	-28 vdc Supply	-27.5±6.0 vdc	0%
GG 1110	5	2.5 vdc Telemetry Bias No. 1	2.5±.06 vdc	0%
GG 1201	5	IMU 28V 800 cps 1%	28.00±0.56V rms	1%
GG 1202	4	IMU 28V 800 cps 5%	28.0±1.4V rms	0.33%
GG 1203	4	IMU 28V 800 cps 5%	28.0±2.1V rms	0.33%
GG 1331	5	3.2 kc 28V Supply 1%	28.6±0.56V rms	1%
GG 1500	4	+28 vdc IMU OPER BUS	28.0-3.5, +5.5 vdc	0%
GG 1510	4	+28 vdc IMU STBY BUS (Stby mode)	28.0-6.0, +5.5 vdc	0%
GG 1513X	5	+28 vdc IMU STBY/OFF	28.0±1 vdc	0%
GG 1520	4	+28 vdc LGC OPER BUS	28.0-3.5, +5.5 vdc	0%
GG 1523X	5	+28 vdc LGC Operate	28.0±1 vdc	0%
GG 2001	5	X PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
GG 2021	5	Y PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
GG 2041	5	Z PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
GG 2106	4	IG Servo Error Total	0.0±60 MV rms at null	1%
GG 2110	4	IG Torque Motor Current	0.125 AMP Max during any fine Align Torque	0%
GG 2112	5	IG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 2113	5	IG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 2136	4	MG Servo Error Total	0.0±60 MV rms at null	1%
GG 2140	4	MG Torque Motor Current	0.125 AMP Max during any fine Align Torque	0%
GG 2142	5	MG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 2143	5	MG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 2166	4	OG Servo Error Total	0.0±60 MV rms at null	1%
GG 2170	4	OG Torque Motor Current	0.125 AMP Max during fine Align Torque	0%
GG 2172	5	OG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 2173	5	OG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 2219	5	Pitch Attitude Error	5.05±0.5V rms at 17°	0.67%
GG 2221	4	IG CDU Coarse Error	0.0±0.68V rms at null	0.29%
GG 1510	4	+28 vdc IMU STBY BUS (Oper. mode)	28.0-4.5, +4.5 vdc	0%

* Link 4 - PSAAM Output Signal

** Link 5 - SCA Output Signal

APPENDIX I (Continued)

Signal	Link	Signal Name	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
GG 2249	5	YAW Attitude Error	5.05±0.5V rms at 17°	0.67%
GG 2251	4	MG CDU Coarse Error	0.0±0.68V rms at null	0.29%
GG 2279	5	Roll Attitude Error	5.05±0.5V rms at 17°	0.67%
GG 2281	4	OG CDU Coarse Error	0.0±0.68V rms at null	0.29%
GG 2300	5	PIPA Temperature	130.5±1.5°F in Operate	2%
GG 2302	4	IMU Heater Current On	28±1 vdc	0%
GG 3304	5	RR Shaft 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 3305	5	RR Shaft 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 3312	4	RR Shaft CDU Coarse Error	0.0±0.68V rms at null	1%
GG 3322	4	RR Trunnion CDU Coarse Error	0.0±0.68V rms at null	1%
GG 3324	5	RR Trunnion 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 3325	5	RR Trunnion 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 4300	4	LGC Temperature	87.5±42.5°F	0.23%
GG 6020	4	PIPA Calibration Module Temperature	67.5±22.5°F	0.23%
GG 6021	4	PSA Temperature	85±25.0°F	0%
NG 1336	4	PHDIFF 3.2KC 28V/LGC SYNC	0° ±10°	3%
NG 1021	4	14 VDC LGC Noise RMS	0.2 VRMS Max	0%
NG 1022	4	14 VDC LGC Noise Peak	5 volts with rise time of 2 to 5 μsec	0%
NG 1031	4	4 VDC LGC Noise RMS	0.2 VRMS Max	0%
NG 1032	4	4 VDC LGC Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1071	4	4 VDC CDU Noise RMS	0.1 VRMS Max	0%
NG 1072	4	4 VDC CDU Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1501	4	28 VDC IMU Operate Noise RMS	1.0 VRMS Max	0%
NG 1502	4	28 VDC IMU Operate Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1511	4	28 VDC IMU Standby Noise RMS	1.0 VRMS Max	0%
NG 1512	4	28 VDC IMU Standby Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1521	4	28 VDC LGC Operate Noise RMS	2.0 VRMS Max	0%
NG 1522	4	28 VDC LGC Operate Noise Peak	5.0 volts with rise time of 2 to 50 μsec	0%

APPENDIX II

K-START TAPE INFORMATION

Name	Number*	Program	R1=YYYYY R1 Display
LM Self-Check Test	F10L004-K10538-XX	Luminary 69	10069
LM G/N OPCHK	F10L004-K10531-XX		10069
LM Semi-Automatic Mode Test	F10L004-K10530-XX		10069
IRIG Scale Factor Test	F10L004-K00081-XX		10069
IMU Performance Test	F10L004-K00083-XX		10069
Alarms and Interrupts Test	F10L004-K10545-XX		10069
LM Self-Check Test	F10L005-K10538-XX	Luminary 99	10099
LM G/N OPCHK	F10L005-K10531-XX		10099
LM Semi-Automatic Mode Test	F10L005-K10530-XX		10099
IRIG Scale Factor Test	F10L005-K00081-XX		10099
IMU Performance Test	F10L005-K00083-XX		10099

*NOTE: Where XX is the revision number.

APOLLO G&N Specification
ND1002380 REV C
Original Issue Date: 29 AUG 68
Release Authority: TDRR 36763
Class A **Release**

POST INSTALLATION CHECKOUT PROCESS SPECIFICATION FOR LM G&N SYSTEM (KSC) WITH LUMINARY FLIGHT ROPES

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				AC	NASA
11/13/68	A	37021	2, 23-109, was 109 pages; now 110 pages.	EA	WLS
6/9/69	B	37638	2,14,15,19,21-110, was 110 pages; now 115 pages.	EA	RJJ
7/9/69	C	37682	30,83	EA	—

This specification consists of page 1 to 115 inclusive.

APPROVALS	**NASA/MSC**	**MIT/IL**	CCB	JH **AC**

6.3.6.4.2 In approximately 2 seconds VERB 06 NOUN 98 shall flash. From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.3.6.5 Enter the following on K-148:

VERB 34 ENTR
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.6.6 IMU HEATER CURRENT Duty Cycle determination.

NOTE: This test is to be performed once in the MSO, once in the VAB and at the PAD during the FRT and CDDT.

6.3.6.6.1 Record PIPA TEMP (GG 2300) reading on the CRT, CAL MOD TEMP (GG 6020) reading on the CRT and the INLET COOLANT Temperature reading.

6.3.6.6.2 Calculate the Duty Cycle for the IMU HEATER CURRENT (GG2302) by dividing the time ON for 10 cycles by the total (ON and OFF) time for 10 cycles as indicated on the event recorder.

6.3.7 Semi-Automatic Mode Test

6.3.7.1 Verify the appropriate K-START tape for LM Semi-Automatic Mode Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.7.1.1 Start tape reader.

6.3.7.1.2 When tape reader stops verify the following on CRT DSKY

a. R1 = +YYYYY (The value of YYYYY is Flight Rope Dependent and is found in Appendix II.)
b. R2 = +10530 (tape number)
c. R3 = -000XX (tape revision number)

6.3.7.2 E-Memory Program Load

6.3.7.2.1 Start tape reader.

6.3.7.2.2 When tape reader stops verify the following on CRT DSKY:

R1 = 00101

6.3.7.3 Command Accuracy 0°.

6.3.7.3.1 Start tape reader.

6.3.7.3.2 When tape stops verify that CRT DSKY R1 indicates 00201. Wait 15 seconds.

6.3.7.3.3 Read and record CRT IMU Gimbal angles. The indications shall be 000±003 degrees.

6.3.7.3.4 Read and record CRT CDU angle indications. The indications shall be +000.00±001.50.

6.3.10 LGC Voltage Margin Test

6.3.10.1 Initial Conditions

6.3.10.1.1 Insure that the G&N System is in the Standby Mode.

6.3.10.1.2 On the CRT, verify the +28 VDC LGC OPERATE bus is between 23.5 and 32.5 vdc (GG 1520).

6.3.10.1.3 On Panel 5, set lighting override ANUN SW to ON. Rotate the ANUN/NUM dimmer fully CCW.

6.3.10.2 Voltage Fail Determination

CAUTION: The +4 VDC LGC supply voltage shall never be operated lower than +2.5 vdc or higher than +5.2 vdc (GG 1030).

The +14 VDC LGC supply shall never be operated at less than +8.5 vdc or higher than +17.0 vdc (GG 1020).

NOTE: The flashing indication of the LGC supplies may be disregarded for this test.

6.3.10.2.1 Enter in C-156, +020041124. Verify the +4 VDC supply is 4.0±0.22 vdc, and execute.

6.3.10.2.2 Enter in C-156, +025141114. Verify the +14 VDC supply is 14.0±0.5 vdc, and execute.

6.3.10.2.3 Enter 0001 into R-155. Verify and execute.

6.3.10.2.4 Enter in C-156, ±XX.X141114. (Enter values for XX.X in incremental steps to lower the +14 VDC to cause an LGC Restart.) Execute.

6.3.10.2.5 Press the MARK X pushbutton on the occurrence of Master Alarm activation.

6.3.10.2.5.1 Verify the RESTART light on the DSKY is on and the LGC Warning light on the CAUTION/WARNING panel is on.

6.3.10.2.5.2 On the G/N panel press the MASTER ALARM pushbutton to reset.

6.3.10.2.6 On the PSA Adapter Module (PSAAM) (410-31080), place the INHIBIT VOLTAGE FAIL switch to ON.

6.3.10.2.7 Verify the LGC Warning light is off.

APOLLO G&N Specification
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POST INSTALLATION CHECKOUT PROCESS SPECIFICATION FOR LM G&N SYSTEM (KSC) WITH LUMINARY FLIGHT ROPES

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals AC	Approvals NASA
11/13/68	A	37021	2, 23-109, was 109 pages; now	EA	WLS
			110 pages.		
6/9/69	B	37638	2, 14, 15, 19, 21-110, was 110	EA	RJJ
			pages; now 115 pages.		
7/9/69	C	37682	30, 83	EA	—
10/1/69	D	37865	2, 8, 12, 16, 17, 20, 30, 31, 39, 63-		
			66, 83-85, 87, 88, 90-99, 104, 105,		
			109, 115, was 115 pages; now		
			117 pages.	EA	MDH

This specification consists of page 1 to 117 inclusive.

APPROVALS	**NASA/MSC**	**MIT/IL**	CCA	**AC**

1.0 INTRODUCTION

1.1 The individual Spacecraft (SC) installed Guidance and Navigation (G&N) System to be checked out per this process specification shall consist of one of each of the following major assemblies. The applicable part numbers shall be determined by Drawing No. 6014999.

Assembly Name

1 - Apollo Guidance Computer Group

1 - Inertial Meas. Unit & Pulse Torque Assembly

1 - Coupling Data Unit

1 - Power and Servo Assembly

1 - Computer Control & Reticle Dimmer Assembly

1 - G&N Interconnect Harness Assembly (LEM)

1 - Signal Conditioner Assembly

1 - Navigation Base Assembly (LEM)

1 - Alignment Optical Telescope (LEM)

1.2 The G&N System herein shall be identified as a LM system. The computer contains the program flight ropes in the core rope memory. The test requirements herein are based on LUMINARY 69; addendums for LUMINARY 99 and LUMINARY 116 are provided.

2.0 SCOPE

2.1 This specification outlines the checkout requirements for G&N System installed in a Lunar Module Vehicle. Addendum to this specification will cover any special checkout requirements associated with individual vehicles, G&N Systems and Computer Flight Programs.

TABLE III

RETEST MATRIX

ragraph mber	Test Title	LGC	IMU	PSA	CDU	RR-CDU	PTA	DSKY	A HARNESS	B HARNESS	Computer Control & Reticle Dimmer	Nav Base	Alignment Optical Telescope	Signal Conditioner
3.1	Standby Power On Test	X	X	X				X	X	X		X		
3.2	Alarms and Interrupts Test	X						X	X					
3.3	IMU Operate Power on Test		X	X	X	X	X		X	X		X		X
3.4	Temperature Control Verification		X	X					X	X		X		X
3.5	PGNCS Power Supply Test			X	X	X	X		X	X		X		X
3.6	G&N Operational Test	X	X	X	X	X	X		X	X		X		
3.7	Semi-Automatic Mode Test		X	X	X				X	X		X		X
3.8	IRIG Scale Factor Test		X				X		X	X		X		
3.9	IMU Performance Test		X				X		X	X		X		
3.10	LGC Voltage Margin Test	X							X					
3.11	LGC Clock Frequency Test	X							X		X			
3.12	Gimbal Friction Test		X						X	X		X		X
3.13	Stabilization Loop Response Test		X	X			X		X	X		X		
3.14**	G&N Fine Alignment Test		X										X	
3.15	AOT Functional Performance Test												X	
3.16	Flight Rope Fixed Memory Bank Sum Check	X							X					
3.17	RR/CDU Control Test					X								
2.1	Emergency Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*	*
2.2	Normal Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*	*
2.3	Initial Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*	*
2.4	General Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*	*

To be used as necessary to turn system on or off.

Procedure from Specification ND1002323 with AURORA 88 ropes installed.

6.2.4.18 On CRT, monitor +120 VDC PIPA SUPPLY (GG 1040) and IMU Gimbal angles. Record time. If 15 minutes have elapsed since performing Paragraph 6.2.4.3, proceed to the next paragraph.

6.2.4.19 Press in +28 VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11. Record time.

6.2.4.20 Verify on the analog recorder that the oscillations of the resolver sine signals (GG 2112, GG 2172, and GG 2142) are not sustained and that the signals damp out within 15 seconds. If this condition is not attained, remove IMU OPERATE power immediately.

6.2.4.21 On the CRT, verify absence of +120 VDC PIPA SUPPLY voltage for 90±10 seconds after Step 6.2.4.19 is initiated. Verify that this voltage is between 114 and 126 after 100 seconds from Step 6.2.4.19.

6.2.4.22 Verify that LGC Warning and ISS Warning lamps in the LM cabin are OFF.

6.2.4.23 On the CRT, verify all IMU Gimbal angles are between 357 and 003 degrees.

6.2.4.24 On K-148, enter the following sequence:

```
VERB 41  NOUN 20  ENTR
+XXXXX            ENTR (270° - Z N.B. azimuth)
+00000            ENTR
+XXXXX            ENTR (Latitude)
```

Wait 15 seconds before proceeding.

```
VERB 40  NOUN 20  ENTR
VERB 25  NOUN 07  ENTR
01303             ENTR
00040             ENTR
```

6.2.4.25 On the CRT, scan the power supply voltages to verify their normal operation. (No indications flashing).

6.2.4.26 After all the tests of 6.3 have been completed, the General Turn-On Procedure (6.2.4) and IMU Operational Test (6.3.6) shall be completed before rerunning any test. Otherwise the testing sequence shall continue in accordance with Figure 1.

6.2.5 Interruption of Power.

6.2.5.1 IMU Operate power shall never be applied without the presence of LGC Operate and IMU Standby Power.

6.2.5.2 The G&N System log book shall include the gimbal positions at time of power shutdown. If omitted, it shall be assumed that the gimbals were not parked prior to shutdown. The log book shall also state if any movement of the IMU or Spacecraft has taken place after shutdown. The times of application and removal of any bus power to the G&N System shall be recorded.

6.2.5.3 After the system has been operating with IMU Operate power on, and a power interruption occurs, immediately set the IMU Operate power circuit breaker to OFF. When power is restored a minimum of 15 minutes operation in Standby Mode is required before resuming IMU Operate power. If the power interruption lasted longer than 15 minutes, the G&N System shall be run in Standby Mode for a time interval at least equal to the duration power was off before resuming IMU Operate power. However, this period need not exceed two hours before application of IMU Operate power.

6.2.6 Warmup Period

A warmup period of at least one hour in Operate Mode is required prior to performing any test in which gyro or accelerometer parameters are measured, and at least 15 minutes prior to any test in which precision amplitude and frequency power supply checks are made.

6.3 Test Procedures

6.3.1 Standby Power On Tests

6.3.1.1 The Portable Temperature Controller, Model No. 400-31058 shall be supplying inertial component heater power to the G&N System through connector 56J1 (P230). If alarm or ail indications are present on the PTC, they shall be cleared by depressing the SYSTEM RESET pushbutton on the PTC.

6.3.1.2 The following switches and/or circuit breakers shall be closed to energize the indicated buses. On Panel 5 rotate ANUN/NUM dimmer to minimum discernable brightness. On Panel 5 set the LIGHTING OVERRIDE switch to OFF.

LOCATION	NOMENCLATURE	IDENTIFICATION
Panel 14	BAT 5 NORMAL FEED	4S10
Panel 14	BAT 6 NORMAL FEED	4S11
Panel 16	X LUNAR BUS TIE	4CB5
Panel 16	BAT 1-4-6 FEED TIE	4CB17
Panel 16	BAT 2-3-5 FEED TIE	4CB25
Panel 16	ASC ECA	4CB14
Panel 16	ASC ECA CONT.	5CB7
Panel 16	DC BUS VOLT	4CB21
Panel 16	DISP.	4CB16
Panel 11	X LUNAR BUS TIE	4CB4
Panel 11	BAT 1-4-6 FEED TIE	4CB18
Panel 11	BAT 2-3-5 FEED TIE	4CB26
Panel 11	ASC ECA	4CB15
Panel 11	ASC ECA CONT.	4CB6
Panel 11	DC BUS VOLT	4CB22

6.3.1.5.2.2 (Continued)

n. Plus signs in Row's 1, 2, 3
o. VERB-NOUN Flashing
p. COMP ACTY

On concurrently for 5 seconds.

q. DSKY blanks - - COMP ACTY remains on for approximately 5 seconds and then blanks.

6.3.1.5.2.3 The DSKY pushbuttons shall be checked by entering:

VERB 25 NOUN 01 ENTR
03375 ENTR
+00123 ENTR
-00456 ENTR
-00789 (Do not press ENTR)

The DSKY shall display +00123 in Row 1, -00456 in Row 2, and -00789 in Row 3. Press CLR pushbutton three times on DSKY. Observe that Row 1, Row 2 and Row 3 are blank.

6.3.1.5.2.4 On the DSKY, enter the following sequence:

VERB 16 NOUN 20 ENTR
VERB
Verify KEY REL light is flashing.
Press KEY REL pushbutton; KEY REL light shall extinguish.

6.3.1.5.3 Lamp Test.

6.3.1.5.3.1 Initiate the Lamp Test by entering in the DSKY:

VERB 35 ENTR

6.3.1.5.3.2 The following DSKY displays shall illuminate for approximately 5 seconds;

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in Row's 1, 2, 3

On concurrently for approximately 5 seconds

On CAUTION/WARNING panel, the following displays shall illuminate, then extinguish.

LGC
ISS

6.3.6.4.2 In approximately 2 seconds VERB 06 NOUN 98 shall flash. From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.3.6.5 Enter the following on K-148:

VERB 34 ENTR
VERB 41 NOUN 20 ENTR
+XXXXX ENTR (270° - Z N.B. Azimuth)
+00000 ENTR
+XXXXX ENTR (Latitude)

Wait 15 seconds before proceeding.

VERB 40 NOUN 20 ENTR
VERB 25 NOUN 07 ENTR
01303 ENTR
00040 ENTR

6.3.6.6 IMU HEATER CURRENT Duty Cycle determination.

NOTE: This test is to be performed once in the MSO, once in the VAB, and at the PAD during the FRT and CDDT.

6.3.6.6.1 Record PIPA TEMP (GG 2300) reading on the CRT, CAL MOD TEMP (GG 6020) reading on the CRT and the INLET COOLANT Temperature reading.

6.3.6.6.2 Calculate the Duty Cycle for the IMU HEATER CURRENT (GG2302) by dividing the time ON for 10 cycles by the total (ON and OFF) time for 10 cycles as indicated on the event recorder.

6.3.7 Semi-Automatic Mode Test

6.3.7.1 Verify the appropriate K-START tape for LM Semi-Automatic Mode Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.7.1.1 Start tape reader.

6.3.7.1.2 When tape reader stops verify the following on CRT DSKY
a. R1 = +YYYYY (The value of YYYYY is Flight Rope Dependent and is found in Appendix II.)
b. R2= +10530 (tape number)
c. R3 = -000XX (tape revision number)

6.3.7.2 E-Memory Program Load

6.3.7.2.1 Start tape reader.

6.3.7.2.2 When tape reader stops verify the following on CRT DSKY:

R1 = 00101

6.3.7.3 Command Accuracy 0°.

6.3.7.3.1 Start tape reader.

6.3.7.3.2 When tape stops verify that CRT DSKY R1 indicates 00201. Wait 15 seconds.

6.3.7.3.3 Read and record CRT IMU Gimbal angles. The indications shall be 000±003 degrees.

6.3.7.3.4 Read and record CRT CDU angle indications. The indications shall be +000.00±001.50.

6.3.7.4 Command Accuracy 45°.

6.3.7.4.1 Start tape reader.

6.3.7.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00301. Wait 5 seconds.

6.3.7.4.3 Read and record CRT IMU Gimbal angles. The indications shall be 045±003 degrees.

6.3.7.4.4 Read and record CRT CDU angle indications. Indications shall be +045.00±001.50.

6.3.7.5 CDU Repeating Accuracy 45°.

6.3.7.5.1 Start the tape reader.

6.3.7.5.2 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.3.7.6 Command Accuracy 90°.

6.3.7.6.1 Start tape reader.

6.3.7.6.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00501. GIMBAL LOCK lamp will be lit. Wait 5 seconds.

6.3.7.6.3 Read and record CRT indication of IMU Gimbal angles. The indications shall be 090±003 degrees.

6.3.7.6.4 Read and record CRT CDU angle indications. Indications shall be +090.00±001.50.

6.3.7.7 Command Accuracy 135°.

6.3.7.7.1 Start tape reader.

6.3.7.7.2 When tape reader stops verify CRT DSKY Row 1 indicates 00601. Wait 5 seconds.

6.3.7.7.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 135±003 degrees.

6.3.7.7.4 Read and record CRT CDU angle indications. Indications shall be +135.00±001.50.

6.3.7.24.1
(Cont)

+00600 ENTR
-01700 ENTR

On CRT, verify the following:

YAW ATT ERROR is between +15.3 and +18.7 DEG (GG 2249)
PITCH ATT ERROR is between +05.5 and +06.6 DEG (GG 2219)
ROLL ATT ERROR is between -15.3 and -18.7 DEG (GG 2279)

6.3.7.25

On K-148 enter the following:

VERB 41 NOUN 20 ENTR
+XXXXX ENTR (270° -Z N. B. azimuth)
+00000 ENTR
+XXXXX ENTR (Latitude)

Wait 15 seconds before proceeding.

VERB 40 NOUN 20 ENTR
VERB 25 NOUN 07 ENTR
01303 ENTR
00040 ENTR

6.3.9.13.4 Horizontal Drift Test.

6.3.9.13.4.1 Start tape reader.

6.3.9.13.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.13.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.3.9.13.5 Test Termination.

6.3.9.13.5.1 Start tape reader.

6.3.9.13.5.2 When tape reader stops, wait 10 seconds before continuing.
6.3.9.13.5.3 Start tape reader. When tape reader stops, wait 10 seconds.
6.3.9.14 Test Position +00008.

6.3.9.14.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.14.1.1 Start tape reader.

6.3.9.14.1.2 When tape reader stops, verify DSKY Row 1 displays +00008.

6.3.9.14.2 Start tape reader.

6.3.9.14.2.1 When tape reader stops, wait 20 seconds.

6.3.9.14.3 Test Initialization.

6.3.9.14.3.1 Start tape reader.

6.3.9.14.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.14.4 Horizontal Drift Test

6.3.9.14.4.1 Start tape reader.

6.3.9.14.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.14.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.14.5 Test Termination.

6.3.9.14.5.1 Start tape reader.

6.3.9.14.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.14.5.3 Start tape reader. When tape reader stops, wait 10 seconds.

6.3.9.15 Test Position +00009.

6.3.9.15.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.15.1.1 Start tape reader.

6.3.9.15.1.2 When tape reader stops, verify DSKY Row 1 displays +00009.

6.3.9.15.2 Start tape reader.

6.3.9.15.2.1 When tape reader stops, wait 20 seconds.

6.3.9.15.3 Test Initialization.

6.3.9.15.3.1 Start tape reader.

6.3.9.15.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.15.4 Horizontal Drift Test.

6.3.9.15.4.1 Start tape reader.

6.3.9.15.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.15.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.15.5 Test Termination

6.3.9.15.5.1 Start tape reader.

6.3.9.15.5.2 When tape reader stops, wait 10 seconds before continuing.
6.3.9.15.5.3 Start tape reader. When tape reader stops, wait 10 seconds.
6.3.9.16 Test Position +00010.

6.3.9.16.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.16.1.1 Start tape reader.

6.3.9.16.1.2 When tape reader stops, verify DSKY Row 1 displays +00010.

6.3.9.16.2 Start tape reader.

6.3.9.16.2.1 When tape reader stops, wait 20 seconds.

6.3.9.16.3 Test Initialization.

6.3.9.16.3.1 Start tape reader.

6.3.9.16.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.16.4 Horizontal Drift Test.

6.3.9.16.4.1 Start tape reader.

6.3.9.16.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.16.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.16.5 Test Termination.

6.3.9.16.5.1 Start tape reader.

6.3.9.16.5.2 When tape reader stops, wait 10 seconds before continuing:
6.3.9.16.5.3 Start tape reader. When tape reader stops, wait 10 seconds.
6.3.9.17 Test Position +00011.

6.3.9.17.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.17.1.1 Start tape reader.

6.3.9.17.1.2 When tape reader stops, verify DSKY Row 1 displays +00011.

6.3.9.17.2 Start tape reader.

6.3.9.17.2.1 When tape reader stops, wait 20 seconds.

6.3.9.17.3 Test Initialization.

6.3.9.17.3.1 Start tape reader.

6.3.9.17.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.10 LGC Voltage Margin Test

6.3.10.1 Initial Conditions

6.3.10.1.1 Insure that the G&N System is in the Standby Mode.

6.3.10.1.2 On the CRT, verify the +28 VDC LGC OPERATE bus is between 23.5 and 32.5 vdc (GG 1520).

6.3.10.1.3 On Panel 5, set lighting override ANUN SW to ON. Rotate the ANUN/NUM dimmer fully CCW.

6.3.10.2 Voltage Fail Determination

CAUTION: The +4 VDC LGC supply voltage shall never be operated lower than +2.5 vdc or higher than +5.2 vdc (GG 1030).

The +14 VDC LGC supply shall never be operated at less than +8.5 vdc or higher than +17.0 vdc (GG 1020).

NOTE: The flashing indication of the LGC supplies may be disregarded for this test.

6.3.10.2.1 Enter in C-156, +020041124. Verify the +4 VDC supply is 4.0±0.22 vdc, and execute.

6.3.10.2.2 Enter in C-156, +025141114. Verify the +14 VDC supply is 14.0±0.5 vdc, and execute.

6.3.10.2.3 Enter 0001 into R-155. Verify and execute.

6.3.10.2.4 Enter in C-156, ±XX.X141114. (Enter values for XX.X in incremental steps to lower the +14 VDC to cause an LGC Restart.) Execute.

6.3.10.2.5 Deleted. MARK X pushbutton on the occurrence of Master Alarm activation.

6.3.10.2.5.1 Verify the RESTART light on the DSKY is on and the LGC Warning light on the CAUTION/WARNING panel is on.

6.3.10.2.5.2 On the G/N panel press the MASTER ALARM pushbutton to reset.

6.3.10.2.6 On the PSA Adapter Module (PSAAM) (410-31080), place the INHIBIT VOLTAGE FAIL switch to ON.

6.3.10.2.7 Verify the LGC Warning light is off.

6.3.10.2.8 On the CRT, verify the +14 VDC LGC supply (GG 1020) is between 12.1 and 12.8 vdc.

6.3.10.2.9 Record the final C-START setting.

6.3.10.2.10 Enter in C-156, +025141114. Verify the +14 VDC supply is 14.0±0.5 vdc, and execute.

6.3.10.2.11 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to OFF.

6.3.10.2.12 On the DSKY, press the Error Reset (RSET) pushbutton.

6.3.10.2.12.1 Verify the RESTART light is off.

6.3.10.2.13 Enter in C-156, ±XX.X141114. (Enter values for XX.X in incremental steps to raise the +14 VDC to cause an LGC Restart.) Execute.

6.3.10.2.14 Deleted. [illegible] pushbutton on two occurrences of Master Alarm activation.

6.3.10.2.14.1 Verify the RESTART light on the DSKY is on and the LGC Warning light on the CAUTION/WARNING panel is on.

6.3.10.2.14.2 On the G&N panel press the MASTER ALARM pushbutton to reset.

6.3.10.2.15 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to ON.

6.3.10.2.16 Verify the LGC Warning light is off.

6.3.10.2.17 On the CRT, verify the +14 VDC LGC supply (GG 1020) is between 15.6 and 16.5 vdc.

6.3.10.2.18 Record the final C-START setting.

6.3.10.2.19 Enter in C-156, +025141114. Verify the +14 VDC supply is 14.0± 0.5 vdc, and execute.

6.3.10.2.20 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to OFF.

6.3.10.2.21 On the DSKY press the Error Reset (RSET) pushbutton.

6.3.10.2.21.1 Verify the RESTART light is off.

6.3.10.2.22 Enter in C-156, ±XX.X041124. (Enter values for XX.X in incremental steps to lower the +4 VDC supply to cause an LGC Restart.) Verify and execute.

6.3.10.2.23 Deleted.

6.3.10.2.23.1 Verify on the DSKY that the RESTART light is on and on the CAUTION/WARNING panel the LGC Warning light is on..

6.3.10.2.23.2 On the G&N panel press the MASTER ALARM pushbutton to reset.

6.3.10.2.24 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to ON.

6.3.10.2.25 Verify the LGC Warning light is off.

6.3.10.2.26 On the CRT, verify the +4 VDC LGC supply (GG 1030) is between 3.8 and 3.4 vdc.

6.3.10.2.27 Record the final C-START setting.

6.3.10.2.28 Enter in C-156, +020041124. Verify the +4 VDC LGC supply is 4.0± 0.22 vdc, and execute.

6.3.10.2.29 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to OFF.

6.3.10.2.30 On the DSKY press the Error Reset (RSET) pushbutton.

6.3.10.2.30.1 Verify the RESTART light is off.

6.3.10.2.31 Enter in C-156±XX.X041124. (Enter values for XX.X in incremental steps to raise the +4 VDC supply to cause an LGC Restart.) Verify and execute.

6.3.10.2.32 Deleted.

6.3.10.2.32.1 On the DSKY, verify that the RESTART light is on and on the CAUTION/WARNING panel the LGC Warning light is on.

6.3.10.2.32.2 On the G&N panel press the MASTER ALARM pushbutton to reset.

6.3.10.2.33 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to ON.

6.3.10.2.34 Verify the LGC Warning light is off.

6.3.10.2.35 On the CRT verify the +4 VDC LGC supply (GG 1030) is between 4.2 and 4.7 vdc.

6.3.10.2.36 Record the final C-START setting.

6.3.10.3.11 Enter in C-156, ±XX.X141114. (Enter values for XX.X in incremental steps to attain a value for the +14 VDC LGC supply of 16.4 (+0.1, -0.0) vdc). Verify and execute.

6.3.10.3.12 Record the final C-START setting.

6.3.10.3.13 Verify that R2 increments by 2 and the PROG Caution light is off.

6.3.10.3.14 Enter in C-156, ±XX.X041124. (Enter values for XX.X in incremental steps to attain a value for the +4 VDC LGC supply of 4.5 (+0.1, -0.0) vdc). Verify and execute.

6.3.10.3.15 Record the final C-START setting.

6.3.10.3.16 Verify that R2 increments by 2 and the PROG Caution light is off.

6.3.10.3.17 Enter in C-156, ±XX.X141114. (Enter values for XX.X in incremental steps to attain a value for the +14 VDC LGC supply of 12.1 (+0.1, -0.0) vdc). Verify and execute.

6.3.10.3.18 Record the final C-START setting.

6.3.10.3.19 Verify that R2 increments by 2 and that the PROG Caution light is off.

6.3.10.3.20 Enter in C-156, +025141114. Verify and execute.

6.3.10.3.21 Enter in C-156, +020041124. Verify and execute.

6.3.10.3.22 Enter 0000 into R-155.

6.3.10.3.23 Enter in C-156, +000001114. Verify and execute.

6.3.10.3.24 Enter in C-156, +000001124. Verify and execute.

6.3.10.3.25 On the CRT, verify the +14 VDC supply is 14.0±0.5 vdc, and the +4 VDC supply is 4.0±0.22 vdc.

6.3.10.3.26 Start the tape reader (wait 30 seconds).

6.3.10.3.27 On the DSKY, key RSET (Error Reset).

6.3.10.3.28 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to OFF.

6.3.10.3.29 On Panel 5, set the override ANUN SW to OFF. Adjust the ANUN/NUM dimmer.

6.3.10.3.30 Key in the following:

VERB 36 ENTR

6.3.11 LGC Clock Frequency Test

6.3.11.1 Insure that LGC Operate power has been applied for a minimum of 10 minutes.

6.3.11.2 Verify that the counter is connected to the 3.2 kc signal on the hardline.

6.3.11.3 Obtain a 30 second sample of clock frequency.

6.3.11.4 Repeat 6.3.11.3 nine times.

6.3.11.5 The average of the 10 previous readings shall be 30.000000±0.000060 seconds.

6.3.11.6 Insure that the System is not in IMU Operate.

6.3.11.7 Enter the following on K-148:

VERB 37 ENTR
06 ENTR
VERB 50 NOUN 25 shall flash
Row 1 = 00062

Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the STBY lamp is lit.

6.3.11.8 Repeat steps 6.3.11.3 and 6.3.11.5.

6.3.11.9 Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the STBY lamp is not lit. Restart lamp may be on. VERB 37 shall flash on the DSKY. Enter VERB 36 ENTR on DSKY. Wait 10 seconds.

6.3.11.10 MARK X Pushbutton Test.

6.3.11.10.1 On the Computer Control and Reticle Dimmer assembly, press and hold MARK X pushbutton.

6.3.11.10.2 On K-148 enter the following:

VERB 05 NOUN 09 ENTR

On the DSKY observe:

Row 1 = 00112
PROG alarm lamp is lit

Press ERR RSET.

6.3.11.12.2 On CRT verify FAILREG = 00112

PROG alarm lamp is lit

Press ERR RSET.

6.3.11.12.3 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.12.4 Observe that DSKY Row 1 displays 00020.

6.3.11.12.5 Release the REJECT pushbutton.

6.3.11.12.6 Observe that DSKY Row 1 displays 00000.

6.3.11.12.7 Rate of Descent Switch Test

6.3.11.12.7.1 On Panel 5, place the Rate of Descent switch in the Plus position (Up).

6.3.11.12.7.2 Observe that DSKY Row 1 displays 00040.

6.3.11.12.7.3 On Panel 5, place the Rate of Descent switch in the Minus position (Down).

6.3.11.12.7.4 Observe that DSKY Row 1 displays 00100.

6.3.11.12.7.5 On Panel 5, place the Rate of Descent switch in the center position.

6.3.11.12.7.6 On the DSKY observe that Row 1 displays 00000.

6.3.11.12.7.7 Enter the following on K-148:

VERB 34 ENTR

6.3.11.13 Reticle Brightness Control Test

6.3.11.13.1 On the DSKY perform the following operation:

VERB 36 ENTR

6.3.11.13.2 On panel 11 close PGNS AOT lamp circuit breaker. On the Computer Control and Reticle Dimmer assembly, rotate the RETICLE BRIGHTNESS control to its minimum light intensity position. View through the AOT and verify that the Reticle lamp is off.

6.3.11.13.3 While viewing through the AOT, slowly rotate the RETICLE BRIGHTNESS control to increase the reticle brightness until a stop is reached. Observe that the reticle brightness has increased in intensity. Return RETICLE BRIGHTNESS control to off state. On panel 11 open PGNS AOT lamp circuit breaker.

6.3.11.14 AOT Eyepiece Heater Test.

6.3.11.14.1 Secure milliammeter HP 428B and current probe HP 428A-21A.

6.3.11.14.2 Locate P1 at Computer Control and Reticle Dimmer assembly. Push lacing cord away from P1 back to fifth tie point.

6.3.11.14.3 Clip current probe HP 428A-21A to blue wire in cable with red arrow pointing away from P1. Measure and record current indication. The current shall be between 139 and 244 ma.

6.3.11.14.4 Remove current probe, push lacing cord back to P1 and spot tie.

6.3.12 Gimbal Friction Test

6.3.12.1 Inner Gimbal Friction Test.

6.3.12.1.1 On K-148, enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds

6.3.12.1.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00150).

6.3.12.1.3 Set up Analog Recorder to monitor the following signals.

Meas. No.	Signal Name
a. GG 2110	IG Torque Motor Current
b. GG 2106	IG Servo Error Total
c. GG 2107	IG Servo Error In Phase
d. GG 2112	IG 1X Resolver Sine
e. GG 2113	IG 1X Resolver Cosine
f. GG 2220	IG CDU Fine Error
g. GG 1201	IMU 28V 1 percent 800 CPS
h. GG 2221	IG CDU Coarse Error

6.3.12.1.4 Set up Analog Recorder to monitor the following signals:

Meas. No.	Signal Name
GG 2300	PIPA TEMP
GG 1520	+28 VDC LGC OPR BUS

6.3.12.1.5 After 10 seconds has elapsed since Step 6.3.12.1.1, enter the following into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR (OGC)
00000 ENTR

6.3.12.1.6 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.1.7 On K-148,enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
37777 ENTR ENTR
37743 ENTR ENTR
00000 ENTR ENTR
00000 ENTR (once)

6.3.12.1.8 IG -360° TORQUE

6.3.12.1.9 On K-148, enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.1.10 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.1.11 On K-148,enter the following sequence:

VERB 40 NOUN 20 ENTER Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
[illegible]
[illegible] ENTR
[illegible] [illegible]
[illegible] [illegible]
[illegible]
[illegible] 41 [illegible]
[illegible] ENTR
[illegible] [illegible]

6.3.12.1.11 (continued) [illegible] ENTR
[illegible]
VERB [illegible] NOUN [illegible] ENTR
[illegible] ENTR
[illegible] ENTR
[illegible] ENTR

6.3.12.1.12 On the CRT, verify CDU X, CDU Y, CDU Z all indicate +00000 (±00150).

6.3.12.1.13 After 10 seconds has elapsed since Step 6.3.12.1.11, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.1.14 Verify on CRT, DSKY display.

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.1.15 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
40000 ENTR ENTR
40034 ENTR ENTR
00000 ENTR ENTR
00000 ENTR (once)
40034 ENTR ENTR
Verify R1 = 40034
00000 ENTR ENTR
Verify R1 = 00000
00000 ENTR (once)
Verify R1 = 00000

6.3.12.1.16 IG +360° TORQUE

6.3.12.1.17 On K-148 enter the following sequence

VERB 42 ENTR
VERB 33 ENTR

6.3.12.1.18 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.2 Outer Gimbal Friction Test

6.3.12.2.1 On K-148, enter the following sequence:

VERB 40 NOUN 20 ENTR, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.2.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00150).

6.3.12.2.3 Set up analog recorder to monitor the following:

	Meas. No.	Signal Name
a.	GG 2167	OG Servo Error In Phase
b.	GG 2170	OG Torque Motor Current
c.	GG 2166	OG Servo Error Total
d.	GG 2280	OG CDU Fine Error
e.	GG 2172	OG 1X Resolver Sine
f.	GG 2173	OG 1X Resolver Cosine
g.	GG 2281	OG CDU Coarse Error

6.3.12.2.4 After 10 seconds has elapsed since Step 6.3.12.2.1, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
37777 ENTR

6.3.12.2.5 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 = 37777
R3 = 02737

6.3.12.2.6 On K-148, enter the following sequence:

NOUN 15 ENTR
37743 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR (once)

6.3.12.2.7 OG -360° TORQUE

6.3.12.2.8 On K-148, enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.2.9 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.2.10 On K-148, enter the following sequence:

VERB 40 NOUN 20 ENTER, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.2.11 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00150).

6.3.12.2.12 After 10 seconds has elapsed since Step 6.3.12.2.10, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
40000 ENTR

6.3.12.2.13 Verify on CRT, DSKY display:

VERB 21 NOUN 01
R1 = 40000
R3 = 02737

6.3.12.2.14 On K-148 enter the following sequence:

NOUN 15 ENTR
40034 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR

6.3.12.2.15 OG +360° TORQUE

6.3.12.2.16 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.2.17 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.3 **Middle Gimbal Friction Test.**

6.3.12.3.1 On K-148, enter the following sequence:

VERB 45 NOUN 20 ENTR, Wait 10 seconds
VERB 41 NOUN 20 ENTR
[illegible] ENTR
[illegible] ENTR
[illegible] ENTR
Wait 10 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 10 seconds

6.3.12.3.1 (Continued) On K-148, enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+06750 ENTR
Wait 15 seconds
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+06750 ENTR

6.3.12.3.2 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00150, and CDU Z = +06750±00200.

6.3.12.3.3 Set up analog recorder to monitor the following:

	Meas. No.	Signal Name
a.	GG 2136	MG Servo Error Total
b.	GG 2137	MG Servo Error In Phase
c.	GG 2140	MG Torque Motor Current
d.	GG 2143	MG 1X Resolver Cosine
e.	GG 2250	MG CDU Fine Error
f.	GG 2142	MG 1X Resolver Sine
g.	GG 2251	MG CDU Coarse Error

6.3.12.3.4 After 10 seconds have elapsed since Step 6.3.12.3.1, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.3.5 Verify on CRT, DSKY display:

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.3.6 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
14000 ENTR ENTR
00000 ENTR (once)

6.3.12.3.7 MG -135° TORQUE

6.3.12.3.8 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.3.9 Monitor analog recorder. When MG Torque Motor Current (GG 2140) drops to a quiescent level (approximately 6 minutes), stop the recorders.

6.3.12.3.10 On K-148, enter the following sequence:

VERB [illegible] NOUN [illegible] ENTR, [illegible]
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
-06750 ENTR
Wait 15 seconds

6.3.12.3.11 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00150, and CDU Z = -06750±00200.

6.3.12.3.12 After 10 seconds has elapsed since Step 6.3.12.3.10, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.3.13 On the CRT, verify DSKY display:

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.3.14 On K-148 enter the following sequence:

NOUN 15	ENTR
00000	ENTR ENTR
00000	ENTR ENTR
00000	ENTR ENTR
63777	ENTR ENTR
77777	ENTR (once)

6.3.12.3.15 MG +135° TORQUE

6.3.12.3.16 On K-148, enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.3.17 Monitor analog recorder. When the MG Torque Motor Current signal (GG 2140) drops to a quiescent level (approximately 6 minutes) stop the recorders.

6.3.12.3.18 On K-148, enter the following sequence:

VERB 41 NOUN 20	ENTR
+XXXXX	ENTR (270° - Z N.B. Azimuth)
+00000	ENTR
+XXXXX	ENTR (Latitude)
Wait 15 seconds before proceeding	
VERB 40 NOUN 20	ENTR
VERB 25 NOUN 07	ENTR
01303	ENTR
00040	ENTR
Wait 15 seconds	
VERB 36	ENTR

6.3.12.4 Test Analysis.

6.3.12.4.1 Remove the strip charts from analog recorders.

6.3.12.4.2 Examine the traces of the recorded measurements for all six phases of this test to detect any sharp discontinuities. Disregard transients of 0.5 second duration or less on the Gimbal Torque Motor Current traces and disregard all transients on the CDU Fine Error and CDU Coarse, Error traces. The Gimbal Torque Motor currents shall not exceed 0.125 ampere. The CDU Fine Error measurements shall not exceed ±70 mv rms. The CDU Coarse Error measurement shall not exceed ±680 mv rms.

6.3.15 AOT Functional Accuracy Test

NOTE: Use of a Dioptometer is required when sighting through AOT. The included angles between target LOS shall be known to ± 10 arc-seconds. The elevation of each target LOS shall be known to ± 15 arc-seconds.

6.3.15.1 Insure that the G&N System is in the Operate Mode.

6.3.15.2 While viewing through the AOT, instruct a target operator to translate (vertically and laterally) and rotate (in azimuth and elevation) a target until the center of the reticle is visible in the Left and Forward detent AOT positions.

Note: Insure that the target remains stable during the following AOT readings.

6.3.15.3 Place the AOT in the L detent position.
6.3.15.3.1 Place the AOT lamp on and record time.
6.3.15.4 Rotate the AOT control knob until the center of the target reticle is superimposed between the double "Y" reticle. Read and record the dial indication as LY1 = ±XXX.XX.

6.3.15.4.1 Rotate the AOT control knob until the center of the target reticle is no longer superimposed between the double "Y" reticle.

6.3.15.4.2 Repeat the preceding two steps, 6.3.15.4 and 6.3.15.4.1, two more times and average the three results. Record the following:

LY2 = ±XXX.XX
LY3 = ±XXX.XX
LY(AVG) = ±XXX.XX

6.3.15.5 Rotate the AOT control knob until the center of the target reticle is superimposed between the double lines of the spiral reticle. Read and record the dial indication as LS1 = ±XXX.XX.

6.3.15.5.1 Rotate the AOT control knob until the center of the target reticle is no longer superimposed between the double lines of the spiral reticle.

6.3.15.5.2 Repeat the preceding two steps, 6.3.15.5 and 6.3.15.5.1, two more times and average the three results. Record the following:

6.3.15.5.2 -continued-

LS2 = ±XXX.XX
LS3 = ±XXX.XX
LS(AVG) = ±XXX.XX.

6.3.15.6 Rotate the AOT into the F detent position.

6.3.15.7 Rotate the AOT control knob until the center of the target reticle is superimposed between the double "Y" reticle. Read and record the dial indication as FY 1 = ±XXX.XX.

6.3.15.7.1 Rotate the AOT control knob until the center of the target reticle is no longer superimposed between the double "Y" reticle.

6.3.15.7.2 Repeat the preceding two steps, 6.3.15.7 and 6.3.15.7.1, two more times and average the three results. Record the following:

FY2 = ±XXX.XX
FY3 = ±XXX.XX
FY(AVG) = ±XXX.XX.

6.3.15.8 Rotate the AOT control knob until the center of the target reticle is superimposed between the double lines of the spiral reticle. Read and record the dial indications as FS1 = ±XXX.XX

6.3.15.8.1 Rotate the AOT control knob until the center of the target reticle is no longer superimposed between the double lines of the spiral reticle.

6.3.15.8.2 Repeat the preceding two steps, 6.3.15.8 and 6.3.15.8.1, two more times and average the three results. Record the following:

FS2 = ±XXX.XX
FS3 = ±XXX.XX
FS(AVG) = ±XXX.XX

6.3.15.8.3 Turn off the AOT lamp and record time.
6.3.15.9 AOT Angle Calculation

6.3.15.10 On K-148 enter the following sequence:

VERB	NOUN 20	ENTR
±XXXXX		ENTR (270° - S/C AZ)
+00000		ENTR
+02858		ENTR

Verify the NO ATT light is illuminated.

6.3.16 Flight Rope Fixed Memory Bank Sum Check

NOTE: Before proceeding with this test, obtain a Computer Program listing of the flight program being tested. Prepare a list of the bank CKSM bugger words.

6.3.16.1 Verify G&N System in Standby Mode.

6.3.16.2 On K-148 enter the following sequence:

Press ERR RSET
VERB 91 ENTR
Observe VERB 05 NOUN 01 flashing

6.3.16.3 Record the CRT DSKY display indications.

Row 1 = AAAAA	Bank Sum
Row 2 = 000BB	Bank Number
Row 3 = CCCCC	(Bank CKSM bugger word)

Row 1 shall be the same as or the complement of the number displayed in Row 2. Row 3 Indication shall be the same as the bugger word recorded above for the bank tested.

6.3.16.4 On K-148 enter VERB 33 ENTR

6.3.16.5 Repeat paragraphs 6.3.16.3 and 6.3.16.4 until all memory bank sums have been checked.

6.3.16.6 On K-148 enter VERB 34 ENTR.

APPENDIX II

K-START TAPE INFORMATION

Name	Number*	Program	R1=YYYYY R1 Display
LM Self-Check Test	F10L004-K10538-XX	Luminary 69	10069
LM G/N OPCHK	F10L004-K10531-XX		10069
LM Semi-Automatic Mode Test	F10L004-K10530-XX		10069
IRIG Scale Factor Test	F10L004-K00081-XX		10069
IMU Performance Test	F10L004-K00083-XX		10069
Alarms and Interrupts Test	F10L004-K10545-XX		10069
LM Self-Check Test	F10L005-K10538-XX	Luminary 99	10099
LM G/N OPCHK	F10L005-K10531-XX		10099
LM Semi-Automatic Mode Test	F10L005-K10530-XX		10099
IRIG Scale Factor Test	F10L005-K00081-XX		10099
IMU Performance Test	F10L005-K00083-XX		10099
LM Self-Check Test	F10L006-K10538-XX	Luminary 116	10116
LM G/N OPCHK	F10L006-K10531-XX		10116
LM Semi-Automatic Mode Test	F10L006-K10530-XX		10116
IRIG Scale Factor Test	F10L006-K00081-XX		10116
IMU Performance Test	F10L006-K00083-XX		10116
Alarms and Interrupts Test	F10L006-K10545-XX		10116

*NOTE: Where XX is the revision number.

ADDENDUM I

SCOPE: The following changes are required to make ND1002380 applicable as G&N System technical support documentation for systems containing LUMINARY 99 flight ropes.

Change 1. Paragraph 6.3.5.12 must be changed to:

```
VERB 21  NOUN 03    ENTR
03404               ENTR
±XXX.XX             ENTR ENTR (L detent AZ)
03405               ENTR
±XXX.XX             ENTR ENTR (F detent AZ)
03406               ENTR
±XXX.XX             ENTR ENTR (R detent AZ)
03412               ENTR
±XXX.XX             ENTR ENTR (L detent EL)
03413               ENTR
±XXX.XX             ENTR ENTR (F detent EL)
03414               ENTR
±XXX.XX             ENTR      (R detent EL)
```

ADDENDUM II

SCOPE: The following changes are required to make ND1002380 applicable as G&N System technical support documentation for systems containing LUMINARY 116 flight ropes.

Change 1. Paragraph 6.3.5.12 must be changed to:

VERB 21 NOUN 03	ENTR	
03404	ENTR	
±XXX.XX	ENTR ENTR	(L detent AZ)
03405	ENTR	
±XXX.XX	ENTR ENTR	(F detent AZ)
03406	ENTR	
±XXX.XX	ENTR ENTR	(R detent AZ)
03412	ENTR	
±XXX.XX	ENTR ENTR	(L detent EL)
03413	ENTR	
±XXX.XX	ENTR ENTR	(F detent EL)
03414	ENTR	
±XXX.XX	ENTR	(R detent EL)

Change 2. Paragraphs 6.2.2.4.1, 6.3.1.5.3.3, 6.3.1.5.3.3.1, 6.3.1.5.3.3.2, 6.3.1.5.3.3.3, 6.3.1.5.3.3.4.

In each of these paragraphs, change the address entry from 01036 to 01035

Change 3. Paragraphs 6.2.4.24, 6.3.6.5, 6.3.7.25, 6.3.12.3.18.

In each of these paragraphs, change the address entry from 01303 to 01300.

APOLLO G&N Specification
ND1002380 REV E
Original Issue Date: 29 AUG 68
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POST INSTALLATION CHECKOUT PROCESS SPECIFICATION FOR LM G&N SYSTEM (KSC) WITH LUMINARY FLIGHT ROPES

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				AC	NASA
11/13/68	A	37021	2, 23-109, was 109 pages; now	EA	WLS
			110 pages.		
6/9/69	B	37638	2, 14, 15, 19, 21-110, was 110	EA	RJJ
			pages; now 115 pages.		
7/9/69	C	37682	30, 83	EA	--
10/1/69	D	37865	2, 8, 12, 16, 17, 20, 30, 31, 39, 63-		
			66, 83-85, 87, 88, 90-99, 104, 105,		
			109, 115, was 115 pages; now		
			117 pages.	EA	MDH
1/20/70	E	38000	2, 14, 19, 23, 29, 30, 40, 55, 61, 62,	EA	MDH
			69, 86, 115-117. Was 117 pages,		
			now 134 pages.		

This specification consists of pages 1 to 134 inclusive.

APPROVALS	**NASA/MSC**		**MIT/IL**	CCA	**AC**

1.0 INTRODUCTION

1.1 The individual Spacecraft (SC) installed Guidance and Navigation (G&N) System to be checked out per this process specification shall consist of one of each of the following major assemblies. The applicable part numbers shall be determined by Drawing No. 6014999.

Assembly Name

1 - Apollo Guidance Computer Group

1 - Inertial Meas. Unit & Pulse Torque Assembly

1 - Coupling Data Unit

1 - Power and Servo Assembly

1 - Computer Control & Reticle Dimmer Assembly

1 - G&N Interconnect Harness Assembly (LEM)

1 - Signal Conditioner Assembly

1 - Navigation Base Assembly (LEM)

1 - Alignment Optical Telescope (LEM)

1.2 The G&N System herein shall be identified as a LM system. The computer contains the program flight ropes in the core rope memory. The test requirements herein are based on LUMINARY 69; addendums for adaptability to further Luminary releases are provided.

2.0 SCOPE

2.1 This specification outlines the checkout requirements for G&N System installed in a Lunar Module Vehicle. Addendum to this specification will cover any special checkout requirements associated with individual vehicles, G&N Systems and Computer Flight Programs.

6.2.2.4.1 (Cont)
VERB 21 NOUN 01 ENTR
01036 ENTR
40000 ENTR
Verify NO ATT lamp is OFF

6.2.2.5 Pull out +28 VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11 to remove LGC OPERATE power.

6.2.2.6 Pull out +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11 to remove IMU STANDBY power.

6.2.3 Initial Turn-On Procedure

6.2.3.1 The initial power turn-on sequence shall be in the order specified in the test procedures (6.3) observing all cautions and delays as specified.

6.2.4 General Turn-On Procedure

6.2.4.1 This step shall be effective only after having completed the initial turn-on procedures.

6.2.4.2 Proper coolant flow shall be verified.

6.2.4.3 Depress +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11 to supply IMU STANDBY power. Record time.

6.2.4.4 Depress +28 VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11 to supply LGC OPERATE power. The Restart lamp may come on; if it does, press RSET on the DSKY.

6.2.4.5 On K-148, enter the following:

VERB 36 ENTR

6.2.4.6 Verify the appropriate K-START tape for LM Self-Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.2.4.7 Start tape reader.

6.2.4.8 When tape reader stops, verify:

R1 = +YYYYY (The value of YYYYY is Flight Rope Dependent and is found in Appendix II.)
R2 = +10538 (tape number)
R3 = -YYYZX (Z is the Revision to the Rope Revision Number and X is the Tape Revision Number. Tapes in Section B of Appendix II will indicate the value of Z.)

6.2.4.9 Start tape reader.

6.2.4.10 When tape reader stops, verify:

R1 = 00101

6.3.1.5.1.2 Verify the appropriate K-START tape for LM Self-Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.1.5.1.3 Start tape reader.

6.3.1.5.1.4 When tape reader stops, verify:

R1 = +YYYYY (The value of YYYYY is Flight Rope Dependent and is found in Appendix II.)
R2 = +10538 (tape number)
R3 = -YYYZX (Z is the Revision to the Rope Revision Number and X is the Tape Revision Number. Tapes in Section B of Appendix II will indicate the value of Z.)

6.3.1.5.1.5 Load E-Memory Program.

6.3.1.5.1.5.1 Start tape reader.

6.3.1.5.1.5.2 When tape reader stops, verify R1 displays +00101.

6.3.1.5.1.6 Initiate Self-Check.

6.3.1.5.1.6.1 Start Tape reader.

6.3.1.5.1.6.2 When R2 = 00002, start tape reader.

6.3.1.5.1.6.3 When tape reader stops, wait 60 seconds.

6.3.1.5.2 DSKY Check.

6.3.1.5.2.1 Start tape reader.

6.3.1.5.2.2 All the electroluminescent elements (PROG, VERB, NOUN, and Row 1, Row 2, Row 3) shall display the decimal number nine (9). Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Rows 1, 2, 3
l. VERB-NOUN Flashing
m. COMP ACTY

On concurrently for 5 seconds.

6.3.2.3 When the tape reader stops, verify:

R1 = +YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix H.)
R2 = +10545 (Tape number)
R3 = -YYYZX (Z is the Revision to the Rope Revision Number and X is the Tape Revision Number. Tapes in Section B of Appendix II will indicate the value of Z.)

6.3.2.4 Start the tape reader.

6.3.2.4.1 When the tape reader stops, verify:

R1 = 00100

6.3.2.5 Parity Fail Test

6.3.2.5.1 Start the tape reader.

6.3.2.5.2 When the tape reader stops, verify:

a. On the DSKY, the RESTART lamp is lit.
b. The PGNS Caution lamp is lit.

6.3.2.5.3 On the DSKY, press the RSET pushbutton. Verify RESTART and PGNS Caution lamps are not lit.

6.3.2.5.4 Start the tape reader.

6.3.2.5.5 When the tape reader stops, verify:

R1 = 00101

6.3.2.5.6 Start the tape reader

6.3.2.5.7 When the tape reader stops, verify:

R1 = 00200

6.3.2.6 Rupt Lock Test

6.3.2.6.1 Start the tape reader.

6.3.5.20 (Cont) voltage exceeds 5 volts.

Item No.	Measurement No.	Signal
a.	NG 1022	14 VDC LGC Noise Peak
b.	NG 1032	4 VDC LGC Noise Peak
c.	NG 1072	4 VDC CDU Noise Peak
d.	NG 1502	28 VDC IMU Operate Noise Peak
e.	NG 1522	28 VDC LGC Operate Peak

6.3.5.21 The noise peaks of the following signals are demonstrated on the event light when the peaks have a rise time of between 2 and 50 μsec and the peak voltage exceeds 10 volts.

a.	NG 1512	28 VDC IMU Standby Peak.

6.3.6 G&N Operational Test

NOTE: Manual DSKY entries during this test may result in a test abort.

6.3.6.1 Verify the appropriate K-START tape for LM G/N OPCHK is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.6.1.1 Start tape reader.

6.3.6.1.2 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +YYYYY (The value of YYYYY is Flight Rope Dependent and is found in Appendix II.)
b. R2 = +10531 (tape number)
c. R3 = -YYYZX (Z is the Revision to the Rope Revision Number and X is the Tape Revision Number. Tapes in Section B of Appendix II will indicate the value of Z.)

6.3.6.2 E-Memory Program Load and Sum Check

6.3.6.2.1 Start tape reader.

6.3.6.2.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00101.

6.3.6.3 Local g Measurement.

6.3.6.3.1 Start tape reader.

6.3.6.3.2 In approximately 10 minutes, VERB 06 NOUN 98 shall flash.

6.3.6.3.3 From the CRT DSKY display read and record Row 1 and Row 2 (local gravity whole and fractional respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.3.6.4 Horizontal Earth Rate Measurement

6.3.6.4.1 Press PRO pushbutton on DSKY.

6.3.6.4.2 In approximately 2 seconds VERB 06 NOUN 98 shall flash. From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.3.6.5 Enter the following on K-148:

VERB 34		ENTR
VERB 41	NOUN 20	ENTR
+XXXXX		ENTR (270° - Z N.B. Azimuth)
+00000		ENTR
+XXXXX		ENTR (Latitude)

Wait 15 seconds before proceeding.

VERB 40	NOUN 20	ENTR
VERB 25	NOUN 07	ENTR
01303		ENTR
00040		ENTR

6.3.6.6 IMU HEATER CURRENT Duty Cycle determination.

NOTE: This test is to be performed once in the MSO, once in the VAB, and at the PAD during the FRT and CDDT.

6.3.6.6.1 Record PIPA TEMP (GG 2300) reading on the CRT, CAL MOD TEMP (GG 6020) reading on the CRT and the INLET COOLANT Temperature reading.

6.3.6.6.2 Calculate the Duty Cycle for the IMU HEATER CURRENT (GG2302) by dividing the time ON for 10 cycles by the total (ON and OFF) time for 10 cycles as indicated on the event recorder.

6.3.7 Semi-Automatic Mode Test

6.3.7.1 Verify the appropriate K-START tape for LM Semi-Automatic Mode Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.7.1.1 Start tape reader.

6.3.7.1.2 When tape reader stops verify the following on CRT DSKY

a. R1 = +YYYYY (The value of YYYYY is Flight Rope Dependent and is found in Appendix II.)

b. R2= +10530 (tape number)

c. R3 = -YYYZX (Z is the Revision to the Rope Revision Number and X is the Tape Revision Number. Tapes in Section B of Appendix II will indicate the value of Z.)

6.3.7.2 E-Memory Program Load

6.3.7.2.1 Start tape reader.

6.3.7.2.2 When tape reader stops verify the following on CRT DSKY:

R1 = 00101

6.3.7.3 Command Accuracy 0°.

6.3.7.3.1 Start tape reader.

6.3.7.3.2 When tape stops verify that CRT DSKY R1 indicates 00201. Wait 15 seconds.

6.3.8 IRIG Scale Factor Test

6.3.8.1 Verify the appropriate K-START tape for IRIG Scale Factor Test is on the K-START tape reader. The test numbers and their associated Flight Ropes are found in Appendix II.

6.3.8.2 Start tape reader.

6.3.8.2.1 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +YYYYY (The value of YYYYY is Flight Rope Dependent and is found in Appendix II.)
b. R2 = +00083 (tape number)
c. R3 = -YYYZX (Z is the Revision to the Rope Revision Number and X is the Tape Revision Number. Tapes in Section B of Appendix II will indicate the value of Z.)

6.3.8.2.2 Start tape reader.

6.3.8.2.3 When tape reader stops, wait 20 seconds.

6.3.8.3 E-Memory Program Load.

6.3.8.3.1 Start tape reader.

6.3.8.3.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00000.

6.3.8.4 Test Position Data Load (+X Scale Factor)

6.3.8.4.1 Start tape reader.

6.3.8.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.3.8.4.3 Start tape reader.

6.3.8.4.4 When tape reader stops, VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nave Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.4.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.4.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001).

6.3.9 IMU Performance Test. A reference data sheet is provided at the end of this section to aid in data reduction.

6.3.9.1 Insure that IMU Operate power and LGC Operate power has been supplied for a minimum of one hour and that the IMU is not in a Gimbal Lock condition.

6.3.9.2 On CRT, monitor and record PIPA TEMP (CG 2300).

6.3.9.3 Verify the appropriate K-START tape for IMU Performance Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.9.4 Start tape reader.

6.3.9.4.1 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +YYYYY (The value of YYYYY is Flight Rope Dependent and is found in Appendix II.)
b. R2 = +00081 (tape number)
c. R3 = -YYYZX(Z is the Revision to the Rope Revision Number and X is the Tape Revision Number. Tapes in Section B of Appendix II will indicate the value of Z.)

6.3.9.4.2 Start tape reader.

6.3.9.4.3 When tape reader stops, wait 10 seconds.

6.3.9.5 Start the tape reader. After 15 seconds, verify IMU is coarse aligned to zero degrees.

6.3.9.6 E-Memory Program Load.

6.3.9.6.1 Start the tape reader. When tape reader stops, verify the following DSKY display:

Row 1
Row 3

6.3.9.7 Test Position +00001.

6.3.9.7.1 E-Memory Program and Test Position Matrix Sum Check

6.3.9.7.1.1 Start tape reader.

6.3.9.7.1.2 When tape reader stops, verify DSKY Row 1 displays +00001.

6.3.9.11.4 **PIPA Scale Factor Test**

6.3.9.11.4.1 Start tape reader. Record time.

6.3.9.11.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM and GIMBAL LOCK lamps shall be lit.

6.3.9.11.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.3.9.11.5 Test Termination.

6.3.9.11.5.1 Start tape reader.

6.3.9.11.5.2 When Tape Reader stops, verify the PROG lamp extinguishes. Wait 10 seconds before continuing.

6.3.9.12 Test Position +00006.

6.3.9.12.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.12.1.1 Start tape reader.

6.3.9.12.1.2 When tape reader stops, verify DSKY Row 1 displays +00006.

6.3.9.12.2 Start tape reader.

6.3.9.12.2.1 When tape reader stops, wait 20 seconds.

6.3.9.12.3 Test Initialization.

6.3.9.12.3.1 Start tape reader.

6.3.9.12.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.12.4 PIPA Scale Factor Test.

6.3.9.12.4.1 Start tape reader. Record time.

6.3.9.12.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM and GIMBAL LOCK lamps shall be lit.

6.3.9.12.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.3.9.12.5 Test Termination.

6.3.9.12.5.1 Start tape reader.

6.3.9.12.5.2 When Tape Reader stops, verify the PROG lamp extinguishes. Wait 10 seconds before continuing.

6.3.9.13 Test Position +00007.

6.3.9.13.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.13.1.1 Start tape reader.

6.3.9.13.1.2 When tape reader stops verify DSKY Row 1 displays +00007.

6.3.9.13.2 Start tape reader.

6.3.9.13.2.1 When tape reader stops, wait 20 seconds.

6.3.9.13.3 Test Initialization.

6.3.9.13.3.1 Start tape reader.

6.3.9.13.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.19.3.1 Start tape reader.

6.3.9.19.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.19.4 Horizontal Drift Test.

6.3.9.19.4.1 Start tape reader.

6.3.9.19.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.19.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.19.5 Test Termination.

6.3.9.19.5.1 Start tape reader.

6.3.9.19.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.20 On CRT, record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.3.9.21 On K-148, enter the following sequence:

VERB 41	NOUN 20	ENTR	
+XXXXX		ENTR	(270° -Z nav base azimuth)
+00000		ENTR	
+XXXXX		ENTR	(latitude)

Wait 15 seconds before proceeding.

3.9.22

VERB 40	NOUN 20	ENTR
VERB 25	NOUN 07	ENTR
01303		ENTR
00040		ENTR

6.3.9.22 Calculations.

NOTE: Use Post Vibration or System Test data points only.

6.3.10.2.37 Enter in C-156, +020041124. Verify the +4 VDC supply is 4.0± 0.22 vdc, and execute.

6.3.10.2.38 On the DSKY press the Error Reset (RSET) pushbutton.

6.3.10.2.38.1 Verify the RESTART light is off.

6.3.10.3 Voltage Margin Determination

6.3.10.3.1 Verify the appropriate K-START tape for LM Self-Check Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.10.3.2 Start the tape reader.

6.3.10.3.3 When the tape reader stops, verify:

R1 = +YYYYY (The value YYYYY is flight Rope dependent and is found in Appendix II)
R2 = +10538 (tape number)
R3 = -YYYZX (Z is the Revision to the Rope Revision Number and X is the Tape Revision Number. Tapes in Section B of Appendix II will indicate the value of Z)

6.3.10.3.4 Load E-Memory Program

6.3.10.3.4.1 Start tape reader.

6.3.10.3.4.2 When the tape reader stops, verify:

R1 = 00101.

6.3.10.3.5 Initiate Self-Check

6.3.10.3.5.1 Start the tape reader.

6.3.10.3.5.2 Verify that neither the RESTART nor PROG lights are lit.

6.3.10.3.6 Enter in C-156, ±XX.X141114. (Enter values for XX.X in incremental steps to attain a value for the +14 VDC LGC supply of 12.1 (+0.1, -0.0) vdc). Verify and execute.

6.3.10.3.7 Record the final C-START setting.

6.3.10.3.8 Enter in C-156, ±XX.X041124. (Enter values for XX.X in incremental steps to attain a value for the +4 VDC LGC supply of 3.4 (+0.1, -0.0) vdc). Verify and execute.

6.3.10.3.9 Record the final C-START setting.

6.3.10.3.10 Verify that R2 increments by 2 and that the PROG Caution light is off.

APPENDIX II, SECTION A

K-START TAPE INFORMATION

Name	Number*	Program	R1=YYYYY R1 Display
LM Self-Check Test	F10L004-K10538-XX	Luminary 69	10069
LM G/N OPCHK	F10L004-K10531-XX		10069
LM Semi-Automatic Mode Test	F10L004-K10530-XX		10069
IRIG Scale Factor Test	F10L004-K00081-XX		10069
IMU Performance Test	F10L004-K00083-XX		10069
Alarms and Interrupts Test	F10L004-K10545-XX		10069
LM Self-Check Test	F10L005-K10538-XX	Luminary 99	10099
LM G/N OPCHK	F10L005-K10531-XX		10099
LM Semi-Automatic Mode Test	F10L005-K10530-XX		10099
IRIG Scale Factor Test	F10L005-K00081-XX		10099
IMU Performance Test	F10L005-K00083-XX		10099
LM Self-Check Test	F10L006-K10538-XX	Luminary 116	10116
LM G/N OPCHK	F10L006-K10531-XX		10116
LM Semi-Automatic Mode Test	F10L006-K10530-XX		10116
IRIG Scale Factor Test	F10L006-K00081-XX		10116
IMU Performance Test	F10L006-K00083-XX		10116
Alarms and Interrupts Test	F10L006-K10545-XX		10116

*NOTE: Where XX is the revision number.

APPENDIX II SECTION B

NEW TAPE NUMBER FORMAT

NAME	NUMBER	PROGRAM	R1	R3
RR CDU I/F Test	F10L0991-K10549-X	Luminary 99	+10099	-YYY1X
LM Self-Check Test	F10L1300-K10538-X	Luminary 130	+10130	-YYY0X
LM G/N OPCHK	F10L1300-K10531-X	↓	+10130	-YYY0X
LM Semi-Automatic Mode Test	F10L1300-K10530-X		+10130	-YYY0X
IRIG Scale Factor Test	F10L1300-K00081-X		+10130	-YYY0X
IMU Performance Test	F10L1300-K00083-X		+10130	-YYY0X
Alarms and Interrupts Test	F10L1300-K10545-X		+10130	-YYY0X
Alms & Int Test/Restrt Mon	F10L1300-K10550-X		+10130	-YYY0X
RR CDU I/F Test	F10L1300-K10549-X		+10130	-YYY0X

NOTE: X is the tape revision number. YYY is the spacecraft number (only assigned to MIT Mission E-Memory Load Tapes). The Revision to the Rope Revision number is found in the R3 display, second digit from right.

ADDENDUM I

SCOPE: The following changes are required to make ND1002380 applicable as G&N System technical support documentation for systems containing LUMINARY 99 REV 1 flight ropes.

Change 1. Paragraph 6.3.5.12 must be changed to:

VERB 21 NOUN 03	ENTR
03404	ENTR
±XXX.XX	ENTR ENTR (L detent AZ)
03405	ENTR
±XXX.XX	ENTR ENTR (F detent AZ)
03406	ENTR
±XXX.XX	ENTR ENTR (R detent AZ)
03412	ENTR
±XXX.XX	ENTR ENTR (L detent EL)
03413	ENTR
±XXX.XX	ENTR ENTR (F detent EL)
03414	ENTR
±XXX.XX	ENTR (R detent EL)

Change 2. Replace Paragraphs 6.3.17 through 6.3.17.3.5 with the following:

6.3.17 RR/CDU Control Test

NOTE: RR CDU testing requires that the Rendezvous Radar is operating. The Rendezvous Radar is not activated until Integrated testing. To insure that the RR CDU's are operating properly, the minimum requirements for RR CDU testing are presented here so that they may be included as part of the requirements to be demonstrated at the first opportunity after Rendezvous Radar activation.

6.3.17.1 Initialization

6.3.17.1.1 Verify the appropriate K-START Tape for RR CDU I/F Test is on the K-START Tape Reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.17.1.2 Start Tape Reader.

6.3.17.1.3 When the Tape Reader stops, verify the following on the CRT DSKY:

R1 = +YYYYY (The value of YYYYY is Flight Rope dependent and is found in Appendix II.)
R2 = +10549 (Tape Number)
R3 = -YYYZX (Z is the Revision to the Rope Revision number and X is the Tape Revision Number.)

6.3.17.1.4 Start Tape Reader.

6.3.17.1.5 When the Tape Reader stops, press KEY RELEASE. Verify the NO ATT light on the DSKY is lit. Wait 25 seconds before proceeding.

6.3.17.2 CDU Fine and CDU Coarse Error

6.3.17.2.1 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
GG3311	Shaft CDU Fine Error
GG3312	Shaft CDU Coarse Error
GG3321	Trunnion CDU Fine Error
GG3322	Trunnion CDU Coarse Error

6.3.17.2.2 Start Tape Reader.

6.3.17.2.3 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 (Flashing)
R1 = 00006
R2 = 00002

6.3.17.2.4 Start Tape Reader.

6.3.17.2.5 The Tape Reader stops. VERB 41 will be displayed and the rest of the DSKY will blank.

6.3.17.2.6 Before proceeding, verify on CRT that RR CDU Trunnion and Shaft angles indicate +045.00±000.30 degrees.

6.3.17.2.7 Verify the following signals on the CRT:

RR Shaft 1X sin (GG3304)	+18.4±1.84V RMS
RR Shaft 1X cos (GG3305)	+18.4±1.84V RMS
RR Trunnion 1X sin (GG3324)	+18.4±1.84V RMS
RR Trunnion 1X cos (GG3325)	+18.4±1.84V RMS

6.3.17.2.8 Verify RR CDU Fine Errors (GG3311, GG3321) do not exceed 0.07 volts.

6.3.17.2.9 Verify RR CDU Coarse Errors (GG3312, GG3322) do not exceed 0.68 volts.

6.3.17.2.10 Start Tape Reader.

6.3.17.2.11 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 (Flashing)
R1 = 00006
R2 = 00002

6.3.17.2.12 Start Tape Reader.

6.3.17.2.13 The Tape Reader stops. VERB 41 is displayed and the rest of the DSKY will blank.

6.3.17.2.14 Wait 60 seconds. Verify on CRT that RR CDU Trunnion angle indicates +180.00±002.00 degrees, and Shaft angle indicates +320.00±002.00 degrees.

6.3.17.2.15 Start Tape Reader.

6.3.17.2.16 The Tape Reader stops. Wait until the DSKY blanks before proceeding.

6.3.17.2.17 Start Tape Reader.

6.3.17.2.18 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 (Flashing)
R1 = 00006
R2 = 00002

6.3.17.2.19 Start Tape Reader.

6.3.17.2.20 The Tape Reader Stops. VERB 41 is displayed and other DSKY displays blank.

6.3.17.2.21 Wait 30 seconds. Verify on the CRT that RR CDU Trunnion and Shaft angles indicate 000.00±000.30 deg.

6.3.17.2.22 Start Tape Reader.

6.3.17.2.23 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 (Flashing)
R1 = 00006
R2 = 00002

6.3.17.2.24 Start Tape Reader.

6.3.17.2.25 The Tape Reader stops. VERB 41 is displayed and the rest of the DSKY blanks.

6.3.17.2.26 Wait 10 seconds. Verify on CRT that RR CDU Trunnion and Shaft angles indicate +315.00± 000.30 degrees.

6.3.17.3 RR CDU Fail Test (Fine)

6.3.17.3.1 Start Tape Reader.

6.3.17.3.2 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 (Flashing)
R1 = 00006
R2 = 00002

6.3.17.3.3 Start Tape Reader.

6.3.17.3.4 The Tape Reader stops. VERB 41 is displayed and the rest of the DSKY blanks.

6.3.17.3.5 Wait 10 seconds before proceeding to next step.

6.3.17.3.6 Start Tape Reader.

6.3.17.3.7 When the Tape Reader stops, verify RR CDU Fail and Tracker Alarms come ON in approximately 10 seconds.

6.3.17.3.8 Start Tape Reader.

6.3.17.3.9 The Tape Reader stops. Press the error reset pushbutton (RSET) and verify RR CDU Fail and Tracker Alarms are OFF.

6.3.17.3.10 Start Tape Reader.

6.3.17.3.11 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 (Flashing)
R1 = 00006
R2 = 00002

6.3.17.3.12 Start Tape Reader.

6.3.17.3.13 When the Tape Reader stops, verify RR CDU Fail and Tracker Alarms come ON in approximately 10 seconds.

6.3.17.3.14 Start Tape Reader.

6.3.17.3.15 The Tape Reader stops. Press the error reset pushbutton (RSET) and verify RR CDU Fail and Tracker Alarms are OFF.

6.3.17.4 RR CDU Fail Test (Coarse)

6.3.17.4.1 Start Tape Reader.

6.3.17.4.2 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 (Flashing)
R1 = 00006
R2 = 00002

6.3.17.4.3 Start Tape Reader.

6.3.17.4.4 When the Tape Reader stops, verify RR CDU Fail and Tracker Alarms come ON in approximately 10 seconds.

6.3.17.4.5 Start Tape Reader.

6.3.17.4.6 The Tape Reader stops. Press the error reset pushbutton (RSET) and verify that RR CDU Fail and Tracker Alarms are OFF.

6.3.17.4.7 Start Tape Reader.

6.3.17.4.8 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 (Flashing)
R1 = 00006
R2 = 00002

6.3.17.4.9 Start Tape Reader.

6.3.17.4.10 When the Tape Reader stops, verify RR CDU Fail and Tracker Alarms come ON in approximately 10 seconds.

6.3.17.4.11 Start Tape Reader.

6.3.17.4.12 The Tape Reader stops. Press the error reset pushbutton (RSET). Verify RR CDU Fail and Tracker Alarms are OFF.

6.3.17.4.13 Start Tape Reader.

6.3.17.4.14 When the Tape Reader stops, the DSKY blanks.

ADDENDUM II

SCOPE: The following changes are required to make ND1002380 applicable as G&N System technical support documentation for systems containing LUMINARY 116 flight ropes.

Change 1. Paragraph 6.3.5.12 must be changed to:

VERB 21 NOUN 03	ENTR	
03404	ENTR	
±XXX.XX	ENTR ENTR	(L detent AZ)
03405	ENTR	
±XXX.XX	ENTR ENTR	(F detent AZ)
03406	ENTR	
±XXX.XX	ENTR ENTR	(R detent AZ)
03412	ENTR	
±XXX.XX	ENTR ENTR	(L detent EL)
03413	ENTR	
±XXX.XX	ENTR ENTR	(F detent EL)
03414	ENTR	
±XXX.XX	ENTR	(R detent EL)

Change 2. Paragraphs 6.2.2.4.1, 6.3.1.5.3.3, 6.3.1.5.3.3.1, 6.3.1.5.3.3.2, 6.3.1.5.3.3.3, 6.3.1.5.3.3.4.

In each of these paragraphs, change the address entry from 01036 to 01035

Change 3. Paragraphs 6.2.4.24, 6.3.6.5, 6.3.7.25, 6.3.9.21, 6.3.12.3.18.

In each of these paragraphs, change the address entry from 01303 to 01300.

ADDENDUM III

SCOPE: The following changes are required to make ND1002380 applicable as G&N System technical support documentation for systems containing the Restart Monitor package as defined on drawing P/N 2898989.

Change 1: Add the following paragraphs after Paragraph 5.10.3:

5.10.4 If an LGC RESTART or LGC WARNING occurs, the following entries should be made on the DSKY or K-148:

VERB 01 NOUN 10 ENTR
00077 ENTR

Record DSKY Row 1.

VERB 21 NOUN 10 ENTR
00077 ENTR
00000 ENTR

5.10.5 The contents of Row 1 should be interpreted as follows:

Alarm Source	Channel 77 Code (Octal)
** * Parity Fail (F Memory)	001
** * Parity Fail (E Memory)	003
** TC Trap	004
** Rupt Lock	010
** Nightwatchman	020
*** Voltage Fail	040
Counter Fail	100
Scaler Fail	200
Scaler Double Frequency Alarm	400

* NOTE: Parity Fail will either be in E or F Memory, but not in combination.

**NOTE: There is a possibility that a Counter Fail Alarm will also occur, depending on when the alarm occurs, in which case Bit 7 will also be set.

***NOTE: Other alarms will probably occur before the Voltage Fail Alarm occurs, in which case the contents of Channel 77 will contain the octal sum of all the alarms, but it will contain the Voltage Fail code.

Change 2: Add the following paragraph after Paragraph 6.2.4.4:

6.2.4.4.1 On K-148 enter the following:

VERB 21 NOUN 10 ENTR
00077 ENTR
00000 ENTR

Change 3: Replace Paragraphs 6.3.2 through 6.3.2.8.5 with the following:

6.3.2 Alarms and Interrupts Test with Restart Monitor

6.3.2.1 Verify the appropriate K-START Tape for LM ALMS & INT TEST/RSTRT MON is on the K-START Tape Reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.2.2 Start the Tape Reader.

6.3.2.3 When the Tape Reader stops, verify:

R1 = +YYYYY (The value YYYYY is Flight Rope dependent and is found in Appendix II)
R2 = +10550
R3 = -YYYZX (X is the tape revision number and Z is the revision number to the rope revision. Tapes listed in Section B of Appendix II will indicate the value of Z.)

6.3.2.4 Start the Tape Reader.

6.3.2.4.1 When the Tape Reader stops, verify:

R1 = 00100

6.3.2.5 Parity Fail Test

6.3.2.5.1 Start the Tape Reader.

6.3.2.5.2 When the Tape Reader stops, verify the following:

(a) On the DSKY, the Restart lamp is lit.
(b) The PGNCS Caution lamp is lit.
(c) R1 = 00001 or 00101

6.3.2.5.3 On the DSKY, press the RSET pushbutton. Verify RESTART and PGNCS Caution lamps are not lit.

6.3.2.5.4 Start the Tape Reader.

6.3.2.5.5 When the Tape Reader stops, verify:

R1 = 00101

6.3.2.5.6 Start the Tape Reader.

6.3.2.5.7 When the Tape Reader stops, verify:

R1 = 00200

6.3.2.6 Rupt Lock Test

6.3.2.6.1 Start the Tape Reader.

6.3.2.6.2 When the Tape Reader stops, verify the following:

(a) On the DSKY, the RESTART lamp is lit.
(b) The PGNCS Caution lamp is lit.
(c) R1 = 00010 or 00110

6.3.2.6.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNCS Caution lamps are not lit.

6.3.2.6.4 Start the Tape Reader.

6.3.2.6.5 When the Tape Reader stops, verify:

R1 = 00201.

6.3.2.6.6 Start the Tape Reader.

6.3.2.6.7 When the Tape Reader stops, verify:

R1 = 00300.

6.3.2.7 TC Trap Test

6.3.2.7.1 Start Tape Reader.

6.3.2.7.2 When the Tape Reader stops, verify the following:

(a) On the DSKY, the RESTART lamp is lit.
(b) The PGNCS Caution Lamp is lit.
(c) R1 = 00004 or 00104

6.3.2.7.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNCS Caution lamps are not lit.

6.3.2.7.4 Start the Tape Reader.

6.3.2.7.5 When the Tape Reader stops, verify:

R1 = 00301

6.3.2.7.6 Start the Tape Reader.

6.3.2.7.7 When the Tape Reader stops, verify the following:

(a) On the DSKY, the RESTART lamp is lit.
(b) The PGNCS Caution lamp is lit.
(c) R1 = 00004 or 00104

6.3.2.7.8 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNCS Caution lamps are not lit.

6.3.2.7.9 Start the Tape Reader.

6.3.2.7.10 When the Tape Reader stops, verify:

R1 = 00302

6.3.2.7.11 Start the Tape Reader.

6.3.2.7.12 When the Tape Reader stops, verify:

R1 = 00400

6.3.2.8 Nightwatchman Test

6.3.2.8.1 Start the Tape Reader.

6.3.2.8.2 When the Tape Reader stops, verify the following:

(a) The RESTART lamp on the DSKY is lit.
(b) The PGNCS Caution lamp is lit.
(c) R1 = 00020 or 00120.

6.3.2.8.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNCS Caution lamps are not lit.

6.3.2.8.4 Start the Tape Reader.

6.3.2.8.5 When the Tape Reader stops, verify:

R1 = 00401

Change 4: Add the following after Paragraph 6.3.10.2.5.1:

. . . . . .

6.3.10.2.5.1.1 On K-148, enter the following sequence:

```
VERB 01 NOUN 10 ENTR
00077           ENTR
```

Verify the DSKY Row 1 display has Bit 6 ON. Other combinations of bits are permissible but Bit 6 must be present.

Change 5: Revise Paragraph 6.3.10.2.6 as follows:

6.3.10.2.6 On the PSA Adapter Module (PSAAM) (410-31080), place the INHIBIT VOLTAGE FAIL switch to ON. On the DSKY, enter the following:

```
VERB 21 NOUN 10 ENTR
00077           ENTR
00000           ENTR
```

Change 6: Add the following after Paragraph 6.3.10.2.14.1:

6.3.10.2.14.1 On K-148, enter the following:

```
VERB 01 NOUN 10 ENTR
00077           ENTR
```

Verify the DSKY Row 1 display has Bit 6 ON. Other combinations of bits are permissible but Bit 6 must be present.

Change 7: Revise Paragraph 6.3.10.2.15 as follows:

6.3.10.2.15 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to ON. On the DSKY enter the following:

```
VERB 21 NOUN 10 ENTR
00077           ENTR
00000           ENTR
```

Change 8: Add the following after Paragraph 6.3.10.2.23.1:

6.3.10.2.23.1.1 On K-148, enter the following:

```
VERB 01 NOUN 10 ENTR
00077           ENTR
```

Verify the DSKY Row 1 display has Bit 6 ON. Other combinations of bits are permissible but Bit 6 must be present.

Change 9: Revise Paragraph 6.3.10.2.24 as follows:

6.3.10.2.24 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to ON. On the DSKY enter the following:

VERB 21 NOUN 10 ENTR
00077 ENTR
00000 ENTR

Change 10: Add the following after Paragraph 6.3.10.2.32.1:

6.3.10.2.32.1.1 On K-148 enter the following:

VERB 01 NOUN 10 ENTR
00077 ENTR

Verify the DSKY Row 1 display has Bit 6 ON. Other combinations of bits are permissible but Bit 6 must be present.

Change 11: Revise Paragraph 6.3.10.2.33 as follows:

6.3.10.2.33 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to ON. On the DSKY enter the following:

VERB 21 NOUN 10 ENTR
00077 ENTR
00000 ENTR

Change 12: Add the following after Paragraph 6.3.11.9:

6.3.11.9.1 If a RESTART occurred during the above step, perform the following on K-148:

VERB 21 NOUN 10 ENTR
00077 ENTR
00000 ENTR
Press RSET

ADDENDUM IV

SCOPE: The following changes are required to make ND1002380 applicable as G&N System technical support documentation for systems containing Luminary 130 or 131 flight ropes.

Change 1: Paragraph 6.3.15.12 must be changed to:

VERB 21 NOUN 03 ENTR	
03404	ENTR
±XXX.XX	ENTR ENTR (L detent AZ)
03405	ENTR
±XXX.XX	ENTR ENTR (F detent AZ)
03406	ENTR
±XXX.XX	ENTR ENTR (R detent AZ)
03412	ENTR
±XXX.XX	ENTR ENTR (L detent EL)
03413	ENTR
±XXX.XX	ENTR ENTR (F detent EL)
03414	ENTR
±XXX.XX	ENTR (R detent EL)

Change 2: Paragraphs 6.2.2.4.1, 6.3.1.5.3.3, 6.3.1.5.3.3.1, 6.3.1.5.3.3.2, 6.3.1.5.3.3.3, 6.3.1.5.3.3.4:

In each of these paragraphs, change the address entry from 01036 to 01035.

Change 3: Paragraphs 6.2.4.24, 6.3.6.5, 6.3.7.25, 6.3.12.3.18, 6.3.9.21.

In each of these paragraphs, change the address entry from 01303 to 01300.

Change 4: Replace Paragraphs 6.3.17 through 6.3.17.3.5 with the following:

6.3.17 RR/CDU Control Test

NOTE: RR CDU testing requires that the Rendezvous Radar is operating. The Rendezvous Radar is not activated until Integrated testing. To insure that the RR CDU's are operating properly, the minimum requirements for RR CDU testing are presented here so that they may be included as part of the requirements to be demonstrated at the first opportunity after Rendezvous Radar activation.

6.3.17.1 Initialization

6.3.17.1.1 Verify the appropriate K-START Tape for RR CDU I/F Test is on the K-START Tape Reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.17.1.2 Start Tape Reader.

6.3.17.1.3 When the Tape Reader stops, verify the following on the CRT DSKY:

R1 = +YYYYY (The value of YYYYY if Flight Rope dependent and is found in Appendix II.)
R2 = +10549 (Tape Number)
R3 = -YYYZX (Z is the Revision to the Rope Revision number and X is the Tape Revision number.)

6.3.17.1.4 Start Tape Reader.

6.3.17.1.5 When the Tape Reader stops, press KEY RELEASE. Verify the NO ATT light on the DSKY is lit. Wait 25 seconds before proceeding.

6.3.17.2 CDU Fine and CDU Coarse Error

6.3.17.2.1 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
GG 3311	Shaft CDU Fine Error
GG 3312	Shaft CDU Coarse Error
GG 3321	Trunnion CDU Fine Error
GG 3322	Trunnion CDU Coarse Error

6.3.17.2.2 Start Tape Reader.

6.3.17.2.3 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 (Flashing)
R1 = 00006
R2 = 00002

6.3.17.2.4 Start Tape Reader.

6.3.17.2.5 The Tape Reader stops. VERB 41 will be displayed and the rest of the DSKY will blank.

6.3.17.2.6 Before proceeding, verify on CRT that RR CDU Trunnion and Shaft angles indicate +045.00±000.30 degrees.

6.3.17.2.7 Verify the following signals on the CRT:

RR Shaft 1X sin (GG 3304)	+18.4±1.84V RMS
RR Shaft 1X cos (GG 3305)	+18.4±1.84V RMS
RR Trunnion 1X sin (GG 3324)	+18.4±1.84V RMS
RR Trunnion 1X cos (GG 3325)	+18.4±1.84V RMS

6.3.17.2.8 Verify RR CDU Fine Errors (GG 3311, GG 3321) do not exceed 0.07 volts.

6.3.17.2.9 Verify RR CDU Coarse Errors (GG 3312, GG 3322) do not exceed 0.68 volts.

6.3.17.2.10 Start Tape Reader.

6.3.17.2.11 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 (Flashing)
R1 = 00006
R2 = 00002

6.3.17.2.12 Start Tape Reader.

6.3.17.2.13 The Tape Reader stops. VERB 41 is displayed and the rest of the DSKY will blank.

6.3.17.2.14 Wait 60 seconds. Verify on CRT that RR CDU Trunnion angle indicates +180.00±002.00 degrees, and Shaft angle indicates +320.00±002.00 degrees.

6.3.17.2.15 Start Tape Reader.

6.3.17.2.16 The Tape Reader stops. Wait until the DSKY blanks before proceeding.

6.3.17.2.17 Start Tape Reader.

6.3.17.2.18 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 (Flashing)
R1 = 00006
R2 = 00002

6.3.17.2.19 Start Tape Reader.

6.3.17.2.20 The Tape Reader stops. VERB 41 is displayed and other DSKY displays blank.

6.3.17.2.21 Wait 30 seconds. Verify on the CRT that RR CDU Trunnion and Shaft angles indicate 000.00±000.30 deg.

6.3.17.2.22 Start Tape Reader.

6.3.17.2.23 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 (Flashing)
R1 = 00006
R2 = 00002

6.3.17.2.24 Start Tape Reader.

6.3.17.2.25 The Tape Reader stops. VERB 41 is displayed and the rest of the DSKY blanks.

6.3.17.2.26 Wait 10 seconds. Verify on CRT that RR CDU Trunnion and Shaft angles indicate +315.00±000.30 degrees.

6.3.17.3 RR CDU Fail Test (Fine)

6.3.17.3.1 Start Tape Reader.

6.3.17.3.2 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 (Flashing)
R1 = 00006
R2 = 00002

6.3.17.3.3 Start Tape Reader.

6.3.17.3.4 The Tape Reader stops. VERB 41 is displayed and the rest of the DSKY blanks.

6.3.17.3.5 Wait 10 seconds before proceeding to next step.

6.3.17.3.6 Start Tape Reader.

6.3.17.3.7 When the Tape Reader stops, verify RR CDU Fail and Tracker Alarms come ON in approximately 10 seconds.

6.3.17.3.8 Start Tape Reader.

6.3.17.3.9 The Tape Reader stops. Press the error reset pushbutton (RSET) and verify RR CDU Fail and Tracker Alarms are OFF.

6.3.17.3.10 Start Tape Reader.

6.3.17.3.11 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 (Flashing)
R1 = 00006
R2 = 00002

6.3.17.3.12 Start Tape Reader.

6.3.17.3.13 When the Tape Reader stops, verify RR CDU Fail and Tracker Alarms come ON in approximately 10 seconds.

6.3.17.3.14 Start Tape Reader.

6.3.17.3.15 The Tape Reader stops. Press the error reset pushbutton (RSET) and verify RR CDU Fail and Tracker Alarms are OFF.

6.3.17.4 RR CDU Fail Test (Coarse)

6.3.17.4.1 Start Tape Reader.

6.3.17.4.2 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 (Flashing)
R1 = 00006
R2 = 00002

6.3.17.4.3 Start Tape Reader.

6.3.17.4.4 When the Tape Reader stops, verify RR CDU Fail and Tracker Alarms come ON in approximately 10 seconds.

6.3.17.4.5 Start Tape Reader.

6.3.17.4.6 The Tape Reader stops. Press the error reset pushbutton (RSET) and verify that RR CDU Fail and Tracker Alarms are OFF.

6.3.17.4.7 Start Tape Reader.

6.3.17.4.8 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 (Flashing)
R1 = 00006
R2 = 00002

6.3.17.4.9 Start Tape Reader.

6.3.17.4.10	When the Tape Reader stops, verify RR CDU Fail and Tracker Alarms come ON in approximately 10 seconds.
6.3.17.4.11	Start Tape Reader.
6.3.17.4.12	The Tape Reader stops. Press the error reset pushbutton (RSET). Verify RR CDU Fail and Tracker Alarms are OFF.
6.3.17.4.13	Start Tape Reader.
6.3.17.4.14	When the Tape Reader stops, the DSKY blanks.

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POST INSTALLATION CHECKOUT PROCESS SPECIFICATION FOR LM G&N SYSTEM (KSC) WITH LUMINARY FLIGHT ROPES

Record of Revisions

Date	**Revision Letter**	**TDRR No.**	**Pages Revised**	**Approvals**	
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This specification consists of page 1 to 123 inclusive.

APPROVALS	**NASA/MSC**	**MIT/IL**	CCB E. Austin	JH D. Ziemer	**ACSP**

6.0 DETAILED REQUIREMENTS

6.1 Initial Test Conditions

6.1.1 The IMU shall be supplied with heater power on a continuous basis. The portable temperature controller (Model No. 410-31058) shall be connected at all times although heater power may be supplied from the +28 VDC IMU STANDBY bus and monitored through ACE.

6.1.2 The IMU shall never be without heater power longer than 15 minutes.

6.2 Operational Requirements

6.2.1 Emergency Shutdown Procedure

CAUTION: In the event of any malfunction which might damage the G&N System before the normal shutdown procedure in 6.2.2 can be performed, power shall be removed from the G&N System as soon as possible. If at all possible, without creating any delay, IMU Operate Power should be removed first.

6.2.2 Normal Shutdown Procedure

6.2.2.1 The normal shutdown of a G&N System shall include parking the gimbals prior to removing IMU Operate Power. This is accomplished in the following procedure.

6.2.2.2 On K-148 enter the following sequence:

```
VERB 41 NOUN 20 ENTR
+00000          ENTR
+00000          ENTR
+09000          ENTR
```

6.2.2.3 On the CRT, verify the following platform angles are displayed:

IG is between 357 and 003 degrees
MG is between 087 and 093 degrees
OG is between 357 and 003 degrees
Verify GIMBAL LOCK lamp is lit

6.2.2.4 Pull out +28 VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11 to remove IMU OPERATE power.

6.2.2.4.1 On K-148 enter the following:

```
VERB 21 NOUN 01 ENTR
00034           ENTR
00000           ENTR
```

Verify GIMBAL LOCK lamp is OFF.

6.2.4.18 On CRT, monitor +120 VDC PIPA SUPPLY (GG 1040) and IMU Gimbal angles. Record time. If the time requirements of Paragraph 6.2.4.14 have been met, proceed to the next paragraph.

6.2.4.19 Press in +28 VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11. Record time.

6.2.4.20 Verify on the analog recorder that the oscillations of the resolver sine signals (GG 2112, GG 2172, and GG 2142) are not sustained and that the signals damp out within 15 seconds. If this condition is not attained, remove IMU OPERATE power immediately.

6.2.4.21 On the CRT, verify absence of +120 VDC PIPA SUPPLY voltage for 90±10 seconds after Step 6.2.4.19 is initiated. Verify that this voltage is between 114 and 126 after 100 seconds from Step 6.2.4.19.

6.2.4.22 Verify that LGC Warning and ISS Warning lamps in the LM cabin are OFF.

6.2.4.23 On the CRT, verify all IMU Gimbal angles are between 357 and 003 degrees.

6.2.4.24 On K-148, enter the following sequence:

```
VERB 41  NOUN 20  ENTR
+XXXXX            ENTR (270° - Z N.B. azimuth)
+00000            ENTR
+XXXXX            ENTR (Latitude)
```

Wait 15 seconds before proceeding.

```
VERB 40  NOUN 20  ENTR
VERB 25  NOUN 07  ENTR
01303             ENTR
00040             ENTR
```

6.2.4.25 On the CRT, scan the power supply voltages to verify their normal operation. (No indications flashing).

6.2.4.26 After all the tests of 6.3 have been completed, the General Turn-On Procedure (6.2.4) and IMU Operational Test (6.3.6) shall be completed before rerunning any test. Otherwise the testing sequence shall continue in accordance with Figure 1.

6.2.5 Interruption of Power.

6.2.5.1 IMU Operate power shall never be applied without the presence of LGC Operate and IMU Standby Power.

6.3.1.2 (Continued)

LOCATION	NOMENCLATURE	IDENTIFICATION
Panel 16	INV. NO. 2	4CB13
Panel 14	AC PWR to INV 2 Position	4S14
Panel 11	AC BUS FEED TIE	4CB24
Panel 11	AC BUS VOLT	4CB27
Panel 11	LTG ANUN/DOCK COMP	4CB146
Panel 16	LTG ANUN/DOCK COMP	4CB148

6.3.1.3 IMU Standby Power Turn On

6.3.1.3.1 Press in +28 VDC IMU STANDBY circuit breaker on LM Cabin Panel 11. Record time.

6.3.1.3.2 Verify on the Event Recorder that +28 VDC IMU STANDBY power discrete (GG1513) is on. On CRT +28V IMU STANDBY Bus (GG1510) shall indicate between 22.0 and 33.5.

6.3.1.3.3 The PIPA TEMP, displayed on CRT, shall be monitored periodically for one hour to ensure that the PIPA Temperature Control circuitry is operating to maintain a temperature of 130±5.0 Deg. F. (GG 2300). One hour after performing step 6.3.1.3.2 record PIPA TEMP. The PIPA Temperature shall be 130.5° ±1.5°F.

6.3.1.4 Computer Power Turn On

6.3.1.4.1 Press in +28 VDC LGC OPERATE circuit breaker on LM Cabin Panel 11. RESTART light may be ON, verify LGC Warning is OFF.

6.3.1.4.2 On CRT, +28V LGC Operate Bus (GG 1520) shall indicate between 24.5 and 33.5. Verify on event recorder that +28V LGC OP (GG 1523X) discrete is on. Using DSKY, enter VERB 36 ENTR, then press RSET. All computer alarms shall clear.

6.3.1.4.3 On CRT, the +14 VDC LGC SUPPLY (GG 1020) shall indicate between 13.6 and 14.4 VDC. Record this value.

6.3.1.4.4 On CRT the 28V 3200 CPS SUPPLY (GG 1331) shall indicate between a 28.04 and 29.16 VRMS. Record this value.

6.3.1.5 LGC Operational Tests

6.3.1.5.1 LGC Self-Check.

6.3.1.5.1.1 On K-148, enter the following:

VERB 36 ENTR Wait 10 seconds.

6.3.1.5.2.2 (Continued)

n. Plus signs in Row's 1, 2, 3
o. VERB-NOUN Flashing
p. COMP ACTY

On concurrently for 5 seconds.

q. DSKY blanks - - COMP ACTY remains on for approximately 5 seconds and then blanks.

6.3.1.5.2.3 The DSKY pushbuttons shall be checked by entering:

VERB 25 NOUN 01 ENTR
03375 ENTR
+00123 ENTR
-00456 ENTR
-00789 (Do not press ENTR)

The DSKY shall display +00123 in Row 1, -00456 in Row 2, and -00789 in Row 3. Press CLR pushbutton three times on DSKY. Observe that Row 1, Row 2 and Row 3 are blank.

6.3.1.5.2.4 On the DSKY, enter the following sequence:

VERB 16 NOUN 20 ENTR
VERB
Verify KEY REL light is flashing.
Press KEY REL pushbutton; KEY REL light shall extinguish.

6.3.1.5.3 Lamp Test.

6.3.1.5.3.1 Initiate the Lamp Test by entering in the DSKY:

VERB 35 ENTR

6.3.1.5.3.2 The following DSKY displays shall illuminate for approximately 5 seconds;

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in Row's 1, 2, 3

On concurrently for approximately 5 seconds

On CAUTION/WARNING panel, the following displays shall illuminate, then extinguish.

LGC
ISS

6.3.1.5.3.2 (Continued) 8's remain in the VERB-NOUN display.
+8's remain in DSKY Row's 1, 2 and 3 display.

6.3.1.5.3.3 On K-148 enter the following sequence:

VERB 21 NOUN 01 ENTR
01036 ENTR
40004 ENTR

On the DSKY verify the "VEL" light is ON.

6.3.1.5.3.3.1 On K-148 enter the following sequence:

press ENTR
01036 ENTR
40020 ENTR

On the DSKY verify the "ALT" light is ON and the "VEL" light is off.

6.3.1.5.3.3.2 On K-148 enter the following sequence:

press ENTR
01036 ENTR
40001 ENTR

On the DSKY verify that the first spare lamp under the OPR ERR light is ON and the "ALT" light is OFF.

6.3.1.5.3.3.3 On K-148 enter the following sequence:

press ENTR
01036 ENTR
40002 ENTR

On the DSKY verify that the second spare lamp under the OPR ERR light is ON and the first spare is OFF.

6.3.1.5.3.3.4 On K-148 enter the following sequence:

press ENTR
01036 ENTR
40000 ENTR

On the DSKY verify "ALT", "VEL", and two spare lights under OPR ERR are OFF.

6.3.1.5.4 Uplink Check.

6.3.1.5.4.1 On K-START 148, set LOAD/INHIBIT switch to LOAD, set TAPE/KEY switch to KEY, then enter the following:

6.3.2.4 Start the Tape Reader.

6.3.2.4.1 When the Tape Reader stops, verify:

R1 = 00100.

6.3.2.5 Parity Fail Test.

6.3.2.5.1 Start the Tape Reader.

6.3.2.5.2 When the Tape Reader stops, verify the following:

(a) On the DSKY, the RESTART lamp is lit.
(b) The PGNCS Caution lamp is lit.
(c) R1 = 00001 or 00101

6.3.2.5.3 On the DSKY, press the RSET pushbutton. Verify RESTART and PGNCS Caution lamps are not lit.

6.3.2.5.4 Start the Tape Reader.

6.3.2.5.5 When the Tape Reader stops, verify:

R1 = 00101

6.3.2.5.6 Start the Tape Reader.

6.3.2.5.7 When the Tape Reader stops, verify:

R1 = 00200

6.3.2.6 Rupt Lock Test

6.3.2.6.1 Start the Tape Reader.

6.3.2.6.2 When the Tape Reader stops, verify the following:

(a) On the DSKY, the RESTART lamp is lit.
(b) The PGNCS Caution lamp is lit.
(c) R1 = 00010 or 00110

6.3.2.6.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNCS Caution lamps are not lit.

6.3.2.6.4 Start the Tape Reader.

6.3.2.6.5 When the Tape Reader stops, verify:

R1 = 00201.

6.3.2.6.6 Start the Tape Reader.

6.3.2.6.7 When the Tape Reader stops, verify:

R1 = 00300

6.3.2.7 TC Trap Test

6.3.2.7.1 Start the Tape Reader.

6.3.2.7.2 When the Tape Reader stops, verify the following:

(a) On the DSKY, the RESTART lamp is lit.
(b) The PGNCS Caution Lamp is lit.
(c) R1 = 00004 or 00104

6.3.2.7.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNCS Caution lamps are not lit.

6.3.2.7.4 Start the Tape Reader.

6.3.2.7.5 When the Tape Reader stops, verify:

R1 = 00301

6.3.2.7.6 Start the Tape Reader.

6.3.2.7.7 When the Tape Reader stops, verify the following:

(a) On the DSKY, the RESTART lamp is lit.
(b) The PGNCS Caution lamp is lit.
(c) R1 = 00004 or 00104

6.3.2.7.8 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNCS Caution lamps are not lit.

6.3.2.7.9 Start the Tape Reader.

6.3.2.7.10 When the Tape Reader stops, verify:

R1 = 00302

6.3.2.7.11 Start the Tape Reader.

6.3.2.7.12 When the Tape Reader stops, verify:

R1 = 00400

6.3.2.8 Nightwatchman Test

6.3.2.8.1 Start the Tape Reader.

6.3.2.8.2 When the Tape Reader stops, verify the following:

(a) The RESTART lamp on the DSKY is lit.
(b) The PGNCS Caution lamp is lit.
(c) R1 = 00020 or 00120

6.3.2.8.3 On the DSKY, press the RSET pushbutton. Verify the RESTART and PGNCS Caution lamps are not lit.

6.3.2.8.4 Start the Tape Reader.

6.3.2.8.5 When the Tape Reader stops, verify:

R1 = 00401

6.3.3 IMU Operate Power On Tests

CAUTION: Prior to application of IMU OPERATE power in step 6.3.3.1.4, LGC OPERATE and IMU STANDBY power must have been applied to the G&N System continuously for a minimum of two hours. The only exception is when the requirements of step 6.2.4.14 are met and this does not apply for the initial application of IMU OPERATE power.

6.3.3.1 Verification of Power Turn-On

6.3.3.1.1 Set up analog recorder to monitor the following signals:

SIGNAL NO.	SIGNAL NAME
a. GG 2136	MG Servo Error Total
b. GG 2106	IG Servo Error Total
c. GG 2166	OG Servo Error Total
d. GG 2112	IG 1X Resolver Sine
e. GG 2172	OG 1X Resolver Sine
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1% 800 cps
h. SPARE	

6.3.3.1.2 On CRT, monitor +120 VDC PIPA SUPPLY (GG 1040) and IMU gimbal angles.

6.3.3.1.3 Press in +28 VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11. Record time.

6.3.3.1.3.1 Verify that the "NO ATT" lamp on the DSKY is lighted.

6.3.3.1.4 Verify on analog recorder that the oscillations of the resolver sine signals (GG 2112, GG 2172, and GG 2142) are not sustained and that the signals damp out within 15 seconds. If they don't, remove IMU OPERATE power as soon as possible.

6.3.3.1.5 On the CRT, verify absence of +120 VDC PIPA SUPPLY voltage for 90±10 seconds after step 6.3.3.1.3 is initiated. Verify that this voltage is between 114 and 126 after 100 seconds from step 6.3.3.1.3.

6.3.3.1.6 On event recorder verify the following:

LGC WARNING is OFF (GG 9001)
ISS WARNING is OFF (GG 9002)

6.3.3.1.6.1 On DSKY, verify that the "NO ATT" lamp is off.

6.3.3.1.7 On CRT, verify all IMU gimbal angles indicate approximately 0 degrees.

6.3.3.1.8 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.4 Temperature Control Verification

6.3.4.1 After IMU OPERATE turn-on, periodically check the PIPA TEMP for the next 15 minutes. The PIPA TEMP shall be 130.5±2.0°F. Fifteen (15) minutes after IMU OPERATE turn on the PIPA temperature shall be within 0.5°F of its stabilized value (para 6.3.4.3).

6.3.4.2 When 1 hour has elapsed from the time of IMU OPERATE power turn-on, monitor PIPA TEMP (GG 2300) on the CRT. Monitor and record temperature readings every 5 minutes for 30 minutes. Verify that each reading does not deviate from the average value of each signal by more than 0.1°F.

6.3.4.3 The PIPA Temp shall be 130.5±1.5°F.

6.3.4.4 Verify on the event recorder that IMU Blower Current (GG 2303) and IMU Heater Current (GG 2302) On discretes have been present for the last hour (discretes may cycle off).

6.3.5 PGNCS Power Supply Tests

6.3.5.1 From the CRT, confirm power supply voltages (or temperatures) are as specified and record values observed.

6.3.5.2 The PIPA Calibration Module Temperature (GG 6020) shall be between +47 and +90 DEG F.

6.3.5.3 The PSA Temperature (GG 6021) shall be between +60 and +110 DEG F.

6.3.5.4 The LGC Temperature (GG 4300) shall be between +47 and +122 DEG F.

6.3.5.5 The +28 VDC IMU OPERATE PUS (GG 1500) shall be between 24.5 and 33.5 VDC.

6.3.5.6 The +28 VDC IMU STANDBY BUS (GG 1510) shall be between 23.5 and 32.5 VDC.

6.3.5.20 (Cont) voltage exceeds 5 volts.

Item No.	Measurement No.	Signal
a.	NG 1022	14 VDC LGC Noise Peak
b.	NG 1032	4 VDC LGC Noise Peak
c.	NG 1072	4 VDC CDU Noise Peak
d.	NG 1502	28 VDC IMU Operate Noise Peak
e.	NG 1522	28 VDC LGC Operate Peak

6.3.5.21 The noise peaks of the following signals are demonstrated on the event light when the peaks have a rise time of between 2 and 50 μsec and the peak voltage exceeds 10 volts.

a.	NG 1512	28 VDC IMU Standby Peak.

6.3.5.22 The X PIPA S.G. (2001), the Y PIPA S.G. (2021) and the Z PIPA S.G. (2041) output signals will be ±0.3V rms but not 0.0V rms.

6.3.6 G&N Operational Test

NOTE: Manual DSKY entries during this test may result in a test abort.

6.3.6.1 Verify the appropriate K-START tape for LM G/N OPCHK is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.6.1.1 Start tape reader.

6.3.6.1.2 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +YYYYY (The value of YYYYY is Flight Rope Dependent and is found in Appendix II.)
b. R2 = +10531 (tape number)
c. R3 = -YYYZX (Z is the Revision to the Rope Revision Number and X is the Tape Revision Number. Tapes in Section B of Appendix II will indicate the value of Z.)

6.3.6.2 E-Memory Program Load and Sum Check

6.3.6.2.1 Start tape reader.

6.3.6.2.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00101.

6.3.6.3 Local g Measurement.

6.3.6.3.1 Start tape reader.

6.3.6.3.2 In approximately 10 minutes, VERB 06 NOUN 98 shall flash.

6.3.6.3.3 From the CRT DSKY display read and record Row 1 and Row 2 (local gravity whole and fractional respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.3.6.4 Horizontal Earth Rate Measurement

6.3.6.4.1 Press PRO pushbutton on DSKY.

6.3.10 LGC Voltage Margin Test

6.3.10.1 Initial Conditions

6.3.10.1.1 Insure that the G&N System is in the Standby Mode.

6.3.10.1.2 On the CRT, verify the +28 VDC LGC OPERATE bus is between 23.5 and 32.5 vdc (GG 1520).

6.3.10.1.3 On Panel 5, set lighting override ANUN SW to ON. Rotate the ANUN/NUM dimmer fully CCW.

6.3.10.2 Voltage Fail Determination

CAUTION: The +4 VDC LGC supply voltage shall never be operated lower than +2.5 vdc or higher than +5.2 vdc (GG 1030).

The +14 VDC LGC supply shall never be operated at less than +8.5 vdc or higher than +17.0 vdc (GG 1020).

NOTE: The flashing indication of the LGC supplies may be disregarded for this test.

6.3.10.2.1 Enter in C-156, +020041124. Verify and execute. Verify the +4 VDC LGC supply is 4.0±0.22 vdc.

6.3.10.2.2 Enter in C-156, +025141114. Verify and execute. Verify the +14 VDC LGC supply is 14.0±0.5 vdc.

6.3.10.2.3 Enter 0001 into R-155. Verify and execute.

6.3.10.2.4 Enter in C-156, ±XX.X141114. (Enter values for XX.X in incremental steps to lower the +14 VDC to cause an LGC Restart.) Execute.

6.3.10.2.5 Deleted.

6.3.10.2.5.1 Verify the RESTART light on the DSKY is on and the LGC Warning light on the CAUTION/WARNING panel is on.

6.3.10.2.5.2 On the G/N panel press the MASTER ALARM pushbutton to reset.

6.3.10.2.6 On PSAAM, set INHIBIT VOLTAGE FAIL switch ON. On K-148, enter the following:

VERB 01 NOUN 10 ENTR
00077 ENTR

Verify DSKY Row 1 display has bit 6 on. Other combinations of bits are permissible, but bit 6 must be on.

6.3.10.2.6.1 On K-148, enter the following sequence:

VERB 21 NOUN 10 ENTR
00077 ENTR
00000 ENTR

6.3.10.2.7 Verify the LGC Warning light is off.

6.3.10.2.8 On the CRT, verify the +14 VDC LGC supply (GG 1020) is between 12.1 and 12.8 vdc.

6.3.10.2.9 Record the final C-START setting.

6.3.10.2.10 Enter in C-156, +025141114. Verify and execute. Verify the +14 VDC LGC supply is 14.0±0.5 vdc.

6.3.10.2.11 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to OFF.

6.3.10.2.12 On the DSKY, press the Error Reset (RSET) pushbutton.

6.3.10.2.12.1 Verify the RESTART light is off.

6.3.10.2.13 Enter in C-156, ±XX.X141114. (Enter values for XX.X in incremental steps to raise the +14 VDC to cause an LGC Restart.) Execute.

6.3.10.2.14 Deleted.

6.3.10.2.14.1 Verify the RESTART light on the DSKY is on and the LGC Warning light on the CAUTION/WARNING panel is on.

6.3.10.2.14.2 On the G&N panel press the MASTER ALARM pushbutton to reset.

6.3.10.2.15 On PSAAM, set INHIBIT VOLTAGE FAIL switch ON. On K-148, enter the following:

VERB 01 NOUN 10 ENTR
00077 ENTR

Verify DSKY Row 1 display has bit 6 on. Other combinations of bits are permissible, but bit 6 must be on.

6.3.10.2.15.1 On K-148 enter the following sequence:

VERB 21 NOUN 10 ENTR
00077 ENTR
00000 ENTR

6.3.10.2.16 Verify the LGC Warning light is off.

6.3.10.2.17 On the CRT, verify the +14 VDC LGC supply (GG 1020) is between 15.6 and 16.5 vdc.

6.3.10.2.18 Record the final C-START setting.

6.3.10.2.19 Enter in C-156, +025141114. Verify and execute. Verify the +14 VDC LGC supply is 14.0±0.5 vdc.

6.3.10.2.20 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to OFF.

6.3.10.2.21 On the DSKY press the Error Reset (RSET) pushbutton.

6.3.10.2.21.1 Verify the RESTART light is off.

6.3.10.2.22 Enter in C-156, ±XX.X041124. (Enter values for XX.X in incremental steps to lower the +4 VDC supply to cause an LGC Restart.) Verify and execute.

6.3.10.2.23 Deleted.

6.3.10.2.23.1 Verify on the DSKY that the RESTART light is on and on the CAUTION/WARNING panel the LGC Warning light is on.

6.3.10.2.23.2 On the G&N panel press the MASTER ALARM pushbutton to reset.

6.3.10.2.24 On PSAAM, set INHIBIT VOLTAGE FAIL switch ON. On K-148, enter the following:

```
VERB  01  NOUN  10  ENTR
00077               ENTR
```

Verify DSKY Row 1 display has bit 6 on. Other combinations of bits are permissible, but bit 6 must be on.

6.3.10.2.24.1 On K-148, enter the following sequence:

```
VERB  21  NOUN  10  ENTR
00077               ENTR
00000               ENTR
```

6.3.10.2.25 Verify the LGC Warning light is off.

6.3.10.2.26 On the CRT, verify the +4 VDC LGC supply (GG 1030) is between 3.8 and 3.4 vdc.

6.3.10.2.27 Record the final C-START setting.

6.3.10.2.28 Enter in C-156, +020041124. Verify and execute. Verify the +4 VDC LGC supply is 4.0 ±0.22 vdc.

6.3.10.2.29 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to OFF.

6.3.10.2.30 On the DSKY press the Error Reset (RSET) pushbutton.

6.3.10.2.30.1 Verify the RESTART light is off.

6.3.10.2.31 Enter in C-156±XX.X041124. (Enter values for XX.X in incremental steps to raise the +4 VDC supply to cause an LGC Restart.) Verify and execute.

6.3.10.2.32 Deleted.

6.3.10.2.32.1 On the DSKY, verify that the RESTART light is on and on the CAUTION/WARNING panel the LGC Warning light is on.

6.3.10.2.32.2 On the G&N panel press the MASTER ALARM pushbutton to reset.

6.3.10.2.33 On PSAAM, set INHIBIT VOLTAGE FAIL switch ON. On K-148, enter the following:

```
VERB  01  NOUN  10  ENTR
00077               ENTR
```

Verify DSKY Row 1 display has bit 6 on. Other combinations of bits are permissible, but bit 6 must be on.

6.3.10.2.33.1 On K-148, enter the following sequence:

```
VERB  21  NOUN  10  ENTR
00077               ENTR
00000               ENTR
```

6.3.10.2.34 Verify the LGC Warning light is off.

6.3.10.2.35 On the CRT verify the +4 VDC LGC supply (GG 1030) is between 4.2 and 4.7 vdc.

6.3.10.2.36 Record the final C-START setting.

6.3.10.2.37 Enter in C-156, +020041124. Verify and execute. Verify the +4 VDC LGC supply is 4.0±0.22 vdc.

6.3.10.2.38 On the DSKY press the Error Reset (RSET) pushbutton.

6.3.10.2.38.1 Verify the RESTART light is off.

6.3.10.3 Voltage Margin Determination

6.3.10.3.1 Verify the appropriate K-START tape for LM Self-Check Test is on the K-START tape reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.10.3.2 Start the tape reader.

6.3.10.3.3 When the tape reader stops, verify:

R1 = +YYYYY (The value YYYYY is flight Rope dependent and is found in Appendix II)
R2 = +10538 (tape number)
R3 = -YYYZX(Z is the Revision to the Rope Revision Number and X is the Tape Revision Number. Tapes in Section B of Appendix II will indicate the value of Z)

6.3.10.3.4 Load E-Memory Program

6.3.10.3.4.1 Start tape reader.

6.3.10.3.4.2 When the tape reader stops, verify:

R1 = 00101.

6.3.10.3.5 Initiate Self-Check

6.3.10.3.5.1 Start the tape reader.

6.3.10.3.5.2 Verify that neither the RESTART nor PROG lights are lit.

6.3.10.3.6 Enter in C-156, ±XX.X141114. (Enter values for XX.X in incremental steps to attain a value for the +14 VDC LGC supply of 12.1 (+0.1, -0.0) vdc). Verify and execute.

6.3.10.3.7 Record the final C-START setting.

6.3.10.3.8 Enter in C-156, ±XX.X041124. (Enter values for XX.X in incremental steps to attain a value for the +4 VDC LGC supply of 3.4 (+0.1, -0.0) vdc). Verify and execute.

6.3.10.3.9 Record the final C-START setting.

6.3.10.3.10 Verify that R2 increments by 2 and that the PROG Caution light is off.

6.3.10.3.11 Enter in C-156, ±XX.X141114. (Enter values for XX.X in incremental steps to attain a value for the +14 VDC LGC supply of 16.4 (+0.1, -0.0) vdc). Verify and execute.

6.3.10.3.12 Record the final C-START setting.

6.3.10.3.13 Verify that R2 increments by 2 and the PROG Caution light is off.

6.3.10.3.14 Enter in C-156, ±XX.X041124. (Enter values for XX.X in incremental steps to attain a value for the +4 VDC LGC supply of 4.5 (+0.1, -0.0) vdc). Verify and execute.

6.3.10.3.15 Record the final C-START setting.

6.3.10.3.16 Verify that R2 increments by 2 and the PROG Caution light is off.

6.3.10.3.17 Enter in C-156, ±XX.X141114. (Enter values for XX.X in incremental steps to attain a value for the +14 VDC LGC supply of 12.1 (+0.1, -0.0) vdc). Verify and execute.

6.3.10.3.18 Record the final C-START setting.

6.3.10.3.19 Verify that R2 increments by 2 and that the PROG Caution light is off.

6.3.10.3.20 Enter in C-156, +025141114. Verify and execute.

6.3.10.3.21 Enter in C-156, +020041124. Verify and execute.

6.3.10.3.22 Enter 0000 into R-155.

6.3.10.3.23 Enter in C-156, +000001114. Verify and execute.

6.3.10.3.24 Enter in C-156, +000001124. Verify and execute.

6.3.10.3.25 On the CRT, verify the +14 VDC supply is 14.0±0.5 vdc, and the +4 VDC supply is 4.0±0.22 vdc.

6.3.10.3.26 Start the tape reader (wait 30 seconds).

6.3.10.3.27 On the DSKY, key RSET (Error Reset).

6.3.10.3.28 On the PSAAM, place the INHIBIT VOLTAGE FAIL switch to OFF.

6.3.10.3.29 On Panel 5, set the override ANUN SW to OFF. Adjust the ANUN/NUM dimmer.

6.3.10.3.30 Key in the following:

VERB 36 ENTR

6.3.11 LGC Clock Frequency Test

6.3.11.1 Insure that LGC Operate power has been applied for a minimum of 10 minutes.

6.3.11.2 Verify that the counter is connected to the 3.2 kc signal on the hardline.

6.3.11.3 Obtain a 30 second sample of clock frequency.

6.3.11.4 Repeat 6.3.11.3 nine times.

6.3.11.5 The average of the 10 previous readings shall be 30.000000±0.000060 seconds.

6.3.11.6 Insure that the System is not in IMU Operate.

6.3.11.7 Enter the following on K-148:

VERB 37	ENTR
06	ENTR

VERB 50 NOUN 25 shall flash
Row 1 = 00062

Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the STBY lamp is lit.

6.3.11.8 Repeat steps 6.3.11.3 and 6.3.11.5.

6.3.11.9 Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the STBY lamp is not lit. Restart lamp may be on. VERB 37 shall flash on the DSKY. Enter VERB 36 ENTR on DSKY. Wait 10 seconds.

6.3.11.9.1 If a RESTART or LGC Warning occurred during the above step, perform the following on K-148:

VERB 21 NOUN 10	ENTR
00077	ENTR
00000	ENTR
Press	RSET

6.3.11.10 MARK X Pushbutton Test.

6.3.11.10.1 On the Computer Control and Reticle Dimmer assembly, press and hold MARK X pushbutton.

6.3.11.10.2 On K-148 enter the following:

VERB 05 NOUN 09 ENTR

6.3.11.10.2 (Continued) On the DSKY observe:

Row 1 = 00112
PROG alarm lamp is lit

Press ERR RSET.

6.3.11.10.3 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.10.4 Observe that DSKY Row 1 displays 00004.

6.3.11.10.5 Release MARK X pushbutton.

6.3.11.10.6 Observe the DSKY Row 1 displays 00000.

6.3.11.11 MARK Y Pushbutton Test

6.3.11.11.1 Press and hold the MARK Y Pushbutton on the Computer Control and Reticle Dimmer Assembly.

6.3.11.11.2 On K-148 enter the following:

VERB 05 NOUN 09 ENTR

On the DSKY observe:

Row 1 = 00112
PROG alarm lamp is lit

Press ERR RSET.

6.3.11.11.3 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.1.11.11.4 Observe that DSKY Row 1 displays 00010.

6.3.11.11.5 Release the MARK Y pushbutton.

6.3.11.11.6 Observe that DSKY Row 1 displays 00000.

6.3.11.12 REJECT Pushbutton Test

6.3.11.12.1 Press and hold the REJECT pushbutton on the Computer Control and Reticle Dimmer assembly.

6.3.11.12.2 On CRT verify FAILREG = 00112

PROG alarm lamp is lit

Press ERR RSET.

6.3.11.12.3 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.12.4 Observe that DSKY Row 1 displays 00020.

6.3.11.12.5 Release the REJECT pushbutton.

6.3.11.12.6 Observe that DSKY Row 1 displays 00000.

6.3.11.12.7 Rate of Descent Switch Test

6.3.11.12.7.1 On Panel 5, place the Rate of Descent switch in the Plus position (Up).

6.3.11.12.7.2 Observe that DSKY Row 1 displays 00040.

6.3.11.12.7.3 On Panel 5, place the Rate of Descent switch in the Minus position (Down).

6.3.11.12.7.4 Observe that DSKY Row 1 displays 00100.

6.3.11.12.7.5 On Panel 5, place the Rate of Descent switch in the center position.

6.3.11.12.7.6 On the DSKY observe that Row 1 displays 00000.

6.3.11.12.7.7 Enter the following on K-148:

VERB 34 ENTR

6.3.11.13 Reticle Brightness Control Test

6.3.11.13.1 On the DSKY perform the following operation:

VERB 36 ENTR

6.3.11.13.2 On panel 11 close PGNS AOT lamp circuit breaker. On the Computer Control and Reticle Dimmer assembly, rotate the RETICLE BRIGHTNESS control to its minimum light intensity position. View through the AOT and verify that the Reticle lamp is off.

6.3.11.13.3 While viewing through the AOT, slowly rotate the RETICLE BRIGHTNESS control to increase the reticle brightness until a stop is reached. Observe that the reticle brightness has increased in intensity. Return RETICLE BRIGHTNESS control to off state. On panel 11 open PGNS AOT lamp circuit breaker.

6.3.11.14 AOT Eyepiece Heater Test.

6.3.11.14.1 Secure milliammeter HP 428B and current probe HP 428A-21A.

6.3.11.14.2 Locate P1 at Computer Control and Reticle Dimmer assembly. Push lacing cord away from P1 back to fifth tie point.

6.3.11.14.3 Clip current probe HP 428A-21A to blue wire in cable with red arrow pointing away from P1. Measure and record current indication. The current shall be between 139 and 244 ma.

6.3.11.14.4 Remove current probe, push lacing cord back to P1 and spot tie.

6.3.12 Gimbal Friction Test

6.3.12.1 Inner Gimbal Friction Test.

6.3.12.1.1 On K-148, enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds

6.3.12.1.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00150).

6.3.12.1.3 Set up Analog Recorder to monitor the following signals.

Meas. No.	Signal Name
a. GG 2110	IG Torque Motor Current
b. GG 2106	IG Servo Error Total
c. GG 2107	IG Servo Error In Phase
d. GG 2112	IG 1X Resolver Sine
e. GG 2113	IG 1X Resolver Cosine
f. GG 2220	IG CDU Fine Error
g. GG 1201	IMU 28V 1 percent 800 CPS
h. GG 2221	IG CDU Coarse Error

6.3.12.1.4 Set up Analog Recorder to monitor the following signals:

Meas. No.	Signal Name
GG 2300	PIPA TEMP
GG 1520	+28 VDC LGC OPR BUS

6.3.12.1.5 After 10 seconds has elapsed since Step 6.3.12.1.1, enter the following into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR (OGC)
00000 ENTR

6.3.12.1.6 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.1.7 On K-148,enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
37777 ENTR ENTR
37743 ENTR ENTR
00000 ENTR ENTR
00000 ENTR (once)

6.3.12.1.8 IG -360° TORQUE

6.3.12.1.9 On K-148, enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.1.10 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.1.11 On K-148,enter the following sequence:

VERB 40 NOUN 20 ENTER Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds

6.3.12.1.12 On the CRT, verify CDU X, CDU Y, CDU Z all indicate +00000 (±00150).

6.3.12.1.13 After 10 seconds has elapsed since Step 6.3.12.1.11, enter the following sequence into K-148:

VERB 21 NOUN 01	ENTR
02737	ENTR
00000	ENTR

6.3.12.1.14 Verify on CRT, DSKY display.

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.1.15 On K-148 enter the following sequence:

NOUN 15	ENTR
00000	ENTR ENTR
40000	ENTR ENTR
40034	ENTR ENTR
00000	ENTR ENTR
00000	ENTR (once)
40034	ENTR ENTR
Verify R1 = 40034	
00000	ENTR ENTR
Verify R1 = 00000	
00000	ENTR (once)
Verify R1 = 00000	

6.3.12.1.16 IG +360° TORQUE

6.3.12.1.17 On K-148 enter the following sequence

VERB 42	ENTR
VERB 33	ENTR

6.3.12.1.18 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.2 **Outer Gimbal Friction Test**

6.3.12.2.1 On K-148, enter the following sequence:

VERB 40 NOUN 20 ENTR, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds

6.3.12.2.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00150).

6.3.12.2.3 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2167	OG Servo Error In Phase
b. GG 2170	OG Torque Motor Current
c. GG 2166	OG Servo Error Total
d. GG 2280	OG CDU Fine Error
e. GG 2172	OG 1X Resolver Sine
f. GG 2173	OG 1X Resolver Cosine
g. GG 2281	OG CDU Coarse Error

6.3.12.2.4 After 10 seconds has elapsed since Step 6.3.12.2.1, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
37777 ENTR

6.3.12.2.5 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 = 37777
R3 = 02737

6.3.12.2.6 On K-148, enter the following sequence:

NOUN 15	ENTR
37743	ENTR ENTR
00000	ENTR ENTR
00000	ENTR ENTR
00000	ENTR ENTR
00000	ENTR (once)

6.3.12.2.7 OG -360° TORQUE

6.3.12.2.8 On K-148, enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.2.9 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.2.10 On K-148, enter the following sequence:

VERB 40 NOUN 20 ENTER, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
[illegible] NOUN [illegible] ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
[illegible] NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
[illegible] ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.2.11 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00150).

6.3.12.2.12 After 10 seconds has elapsed since Step 6.3.12.2.10, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
40000 ENTR

6.3.12.2.13 Verify on CRT, DSKY display:

VERB 21 NOUN 01
R1 = 40000
R3 = 02737

6.3.12.2.14 On K-148 enter the following sequence:

NOUN 15 ENTR
40034 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR

6.3.12.2.15 OG +360° TORQUE

6.3.12.2.16 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.2.17 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.3 Middle Gimbal Friction Test.

[illegible] On K-148 enter the following sequence:

[illegible]
VERB 21 NOUN 01 ENTR
[illegible] ENTR
[illegible] ENTR
[illegible] [illegible]
[illegible]
V[illegible] NOUN [illegible] ENTR
[illegible] ENTR
[illegible] ENTR
[illegible] ENTR
[illegible]

6.3.12.3.1 On K-148, enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+06750 ENTR
Wait 15 seconds

6.3.12.3.2 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00150, and CDU Z = +06750±00200.

6.3.12.3.3 Set up analog recorder to monitor the following:

	Meas. No.	Signal Name
a.	GG 2136	MG Servo Error Total
b.	GG 2137	MG Servo Error In Phase
c.	GG 2140	MG Torque Motor Current
d.	GG 2143	MG 1X Resolver Cosine
e.	GG 2250	MG CDU Fine Error
f.	GG 2142	MG 1X Resolver Sine
g.	GG 2251	MG CDU Coarse Error

6.3.12.3.4 After 10 seconds have elapsed since Step 6.3.12.3.1, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.3.5 Verify on CRT, DSKY display:

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.3.6 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
14000 ENTR ENTR
00000 ENTR (once)

6.3.12.3.7 MG -135° TORQUE

6.3.12.3.8 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.3.9 Monitor analog recorder. When MG Torque Motor Current (GG 2140) drops to a quiescent level (approximately 6 minutes), stop the recorders.

6.3.12.3.10 On K-148, enter the following sequence:

[illegible]
[illegible] ENTR
[illegible] ENTR
[illegible] ENTR
[illegible] ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
[illegible] ENTR
[illegible] ENTR
[illegible] ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
[illegible] ENTR
[illegible] ENTR
[illegible] ENTR

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
-06750 ENTR
Wait 15 seconds

6.3.12.3.11 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00150, and CDU Z = -06750±00200.

6.3.12.3.12 After 10 seconds has elapsed since Step 6.3.12.3.10, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.3.13 On the CRT, verify DSKY display:

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6. 3. 12. 3. 14 On K-148 enter the following sequence:

NOUN 15	ENTR
00000	ENTR ENTR
00000	ENTR ENTR
00000	ENTR ENTR
63777	ENTR ENTR
77777	ENTR (once)

6. 3. 12. 3. 15 MG +135° TORQUE

6. 3. 12. 3. 16 On K-148, enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6. 3. 12. 3. 17 Monitor analog recorder. When the MG Torque Motor Current signal (GG 2140) drops to a quiescent level (approximately 6 minutes) stop the recorders.

6. 3. 12. 3. 18 On K-148, enter the following sequence:

VERB 41 NOUN 20	ENTR
+XXXXX	ENTR (270° - Z N. B. Azimuth)
+00000	ENTR
+XXXXX	ENTR (Latitude)
Wait 15 seconds before proceeding	
VERB 40 NOUN 20	ENTR
VERB 25 NOUN 07	ENTR
01303	ENTR
00040	ENTR
Wait 15 seconds	
VERB 36	ENTR

6. 3. 12. 4 Test Analysis.

6. 3. 12. 4. 1 Remove the strip charts from analog recorders.

6. 3. 12. 4. 2 Examine the traces of the recorded measurements for all six phases of this test to detect any sharp discontinuities. Disregard transients of 0. 5 second duration or less on the Gimbal Torque Motor Current traces and disregard all transients on the CDU Fine Error and CDU Coarse Error traces. The Gimbal Torque Motor currents shall not exceed 0. 125 ampere. The CDU Fine Error measurements shall not exceed ±70 mv rms. The CDU Coarse Error measurement shall not exceed ±680 mv rms.

6.3.13 Stabilization Loop Step Response Test

6.3.13.1 IG Response Test

6.3.13.1.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.13.1.2 On CRT, verify IG MG, and OG gimbal angles are between 358 and 002.

6.3.13.1.3 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2106	IG Servo Error Total
b. GG 2107	IG Servo Error In Phase
c. GG 2110	IG Torque Motor Current
d. GG 2112	IG 1X Resolver Sine
e. GG 2113	IG 1X Resolver Cosine
f. GG 2220	IG CDU Fine Error
g. GG 1201	IMU 28V 1 PCT 800 CPS

6.3.13.1.4 On K-148 enter the following:

VERB 40 NOUN 20 ENTR, Wait 10 seconds

6.3.13.1.5 On the CRT verify CDU X, CDU Y AND CDU Z indicate +00000±00200.

CAUTION: If the transients caused by the subsequent step input do not settle within 15 seconds, remove IMU Operate Power.

6.3.13.1.6 Enter 1000 into R-155.

6.3.13.1.7 Press XEQ/SEAL pushbutton on R-155 to enter the DC step voltage into the IG stabilization loop.

6.3.13.1.8 Prepare to start analog recorder.

6.3.13.1.9 Enter 0000 into R-155. Start analog recorder. Press the XEQ/SEAL pushbutton to remove the step input to the IG stabilization loop.

6.3.13.1.10 After the transient on the recorder has settled, stop this recorder.

6.3.13.1.11 From the Servo Error In Phase signal recorder trace measure the time interval (T1, Fig. 2) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 2). The period T1, shall not exceed 0.1 second and the trace shall have no more than 3 overshoots.

6.3.13.2 MG Response Test

6.3.13.2.1 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2136	MG Servo Error Total
b. GG 2137	MG Servo Error In Phase
c. GG 2140	MG Torque Motor Current
d. GG 2142	MG 1X Resolver Sine
e. GG 2143	MG 1X Resolver Cosine
f. GG 2250	MG CDU Fine Error
g. GG 1201	IMU 28V 1% 800 cps

6.3.13.2.2 On the CRT, verify CDU X, CDU Y and CDU Z indicate +00000 (±00200).

CAUTION: If the transients caused by the subsequent step input do not settle within 15 seconds, remove IMU Operate Power.

6.3.13.2.3 Enter 0100 into R-155. Press XEQ/SEAL pushbutton R-155 to enter the DC step voltage into the MG stabilization loop.

6.3.13.2.4 Prepare to start analog recorder.

6.3.13.2.5 Enter 0000 into R-155. Start analog recorder. Press XEQ/SEAL pushbutton to remove the step input to the MG stabilization loop.

6.3.13.2.6 After the transient on the recorder has settled, stop the recorder.

6.3.13.2.7 From the Servo Error In Phase signal recorder trace measure the time interval (T1 Fig. 2) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 2). The period T1, shall not exceed 0.1 seconds and the trace shall have no more than 3 overshoots.

6.3.13.3 OG Response Test

6.3.13.3.1 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2166	OG Servo Error Total
b. GG 2167	OG Servo Error In Phase
c. GG 2170	OG Torque Motor Current

6.3.13.3.1 (Continued)

Meas. No.	Signal Name
d. GG 2172	OG 1X Resolver Sine
e. GG 2173	OG 1X Resolver Cosine
f. GG 2280	OG CDU Fine Error
g. GG 1201	IMU 28V 1% 800 cps

6.3.13.3.2 On the CRT, verify CDU X, CDU Y and CDU Z indicate +00000 (±00200).

CAUTION: If the transients caused by the subsequent step input do not settle within 15 seconds, remove IMU Operate Power.

6.3.13.3.3 Enter 0010 into R-155. Press XEQ/SEAL pushbutton on R-155 to enter the DC step voltage into the OG stabilization loop.

6.3.13.3.4 Prepare to start analog recorder.

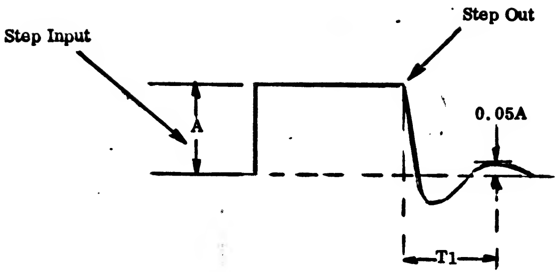
6.3.13.3.5 Enter 0000 into R-155. Start analog recorder. Press XEQ/SEAL pushbutton to remove the step input to the OG stabilization loop.

6.3.13.3.6 After the transient on the recorder has settled, stop the recorder.

6.3.13.3.7 From the Servo Error In Phase signal recorder trace, measure the time interval (T1, Fig. 2) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 2). The period, T1, shall not exceed 0.1 second and the trace shall have not more than 5 overshoots.

6.3.13.3.8 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR



TYPICAL STAB LOOP RESPONSE TO STEP INPUT

FIGURE 2

6.3.15 AOT Functional Accuracy Test

NOTE: Use of a Dioptometer is required when sighting through AOT. The included angles between target LOS shall be known to ±10 arc-seconds. The elevation of each target LOS shall be known to ±15 arc-seconds.

6.3.15.1 Insure that the G&N System is in the Operate Mode.

6.3.15.2 While viewing through the AOT, instruct a target operator to translate (vertically and laterally) and rotate (in azimuth and elevation) a target until the center of the reticle is visible in the Left and Forward detent AOT positions.

Note: Insure that the target remains stable during the following AOT readings.

6.3.15.3 Place the AOT in the L detent position.

6.3.15.3.1 Place the AOT lamp on and record time.

6.3.15.4 Rotate the AOT control knob until the center of the target reticle is superimposed between the double "Y" reticle. Read and record the dial indication as LY1 = ±XXX.XX.

6.3.15.4.1 Rotate the AOT control knob until the center of the target reticle is no longer superimposed between the double "Y" reticle.

6.3.15.4.2 Repeat the preceding two steps, 6.3.15.4 and 6.3.15.4.1, two more times and average the three results. Record the following:

LY2 = ±XXX.XX
LY3 = ±XXX.XX
LY(AVG) = ±XXX.XX

6.3.15.5 Rotate the AOT control knob until the center of the target reticle is superimposed between the double lines of the spiral reticle. Read and record the dial indication as LS1 = ±XXX.XX.

6.3.15.5.1 Rotate the AOT control knob until the center of the target reticle is no longer superimposed between the double lines of the spiral reticle.

6.3.15.5.2 Repeat the preceding two steps, 6.3.15.5 and 6.3.15.5.1, two more times and average the three results. Record the following:

6.3.15.5.2 -continued-

LS2 = ±XXX.XX
LS3 = ±XXX.XX
LS(AVG) = ±XXX.XX.

6.3.15.6 Rotate the AOT into the F detent position.

6.3.15.7 Rotate the AOT control knob until the center of the target reticle is superimposed between the double "Y" reticle. Read and record the dial indication as FY 1 = ±XXX.XX.

6.3.15.7.1 Rotate the AOT control knob until the center of the target reticle is no longer superimposed between the double "Y" reticle.

6.3.15.7.2 Repeat the preceding two steps, 6.3.15.7 and 6.3.15.7.1, two more times and average the three results. Record the following:

FY2 = ±XXX.XX
FY3 = ±XXX.XX
FY(AVG) = ±XXX.XX.

6.3.15.8 Rotate the AOT control knob until the center of the target reticle is superimposed between the double lines of the spiral reticle. Read and record the dial indications as FS1 = ±XXX.XX

6.3.15.8.1 Rotate the AOT control knob until the center of the target reticle is no longer superimposed between the double lines of the spiral reticle.

6.3.15.8.2 Repeat the preceding two steps, 6.3.15.8 and 6.3.15.8.1, two more times and average the three results. Record the following:

FS2 = ±XXX.XX
FS3 = ±XXX.XX
FS(AVG) = ±XXX.XX

6.3.15.8.3 Turn off the AOT lamp and record time.
6.3.15.9 AOT Angle Calculation

6.3.15.10 On K-148 enter the following sequence:

VERB NOUN 20 ENTR
±XXXXX ENTR (270° - S/C AZ)
+00000 ENTR
+02858 ENTR

Verify the NO ATT light is illuminated.

6.3.15.11 On K-148 enter the following sequence:

VERB 25	NOUN 07	ENTR
00104		ENTR
00200		ENTR
00001		ENTR

6.3.15.12 On K-148 enter the following detent calibration data:

VERB 21 NOUN 03	ENTR	
03404	ENTR	
±XXX.XX	ENTR ENTR	(L detent AZ)
03405	ENTR	
±XXX.XX	ENTR ENTR	(F detent AZ)
03406	ENTR	
±XXX.XX	ENTR ENTR	(R detent AZ)
03412	ENTR	
±XXX.XX	ENTR ENTR	(L detent EL)
03413	ENTR	
±XXX.XX	ENTR ENTR	(F detent EL)
03414	ENTR	
±XXX.XX	ENTR	(R detent EL)

6.3.15.13 On K-148 enter the following:

VERB 37	ENTR
00051	ENTR

Verify PROG is 51 on DSKY.

6.3.15.14 Verify VERB 50 NOUN 25 flashing and DSKY display should be:

R1 = 00015

6.3.15.15 On K-148 enter:

VERB 33	ENTR

6.3.15.16 Verify VERB 01 NOUN 71 flashing and DSKY display for R1 is:

R1 = 00CDE

C is the AOT detent code. D and E give the octal star code.

6.3.15.17 On K-148 enter the following sequence:

VERB 21	ENTR
00110	ENTR
VERB 33	ENTR

6.3.15.18 Verify VERB 54 NOUN 71 flashing and DSKY display:

R1 = 00110

6.3.15.19 On Computer Control and Reticle Dimming Assembly, press the MARK X pushbutton.

6.3.15.20 VERB 06 NOUN 79 shall flash and the DSKY shall display:

R1 = XXX.XX (Cursor Angle)
R2 = XXX.XX (Spiral Angle)
R3 = XXXXX (Position Code)

6.3.15.21 On K-148 enter the following:

VERB 25	ENTR
±XXX.XX	ENTR (LY(AVG) from 6.3.15.4.2)
±XXX.XX	ENTR (LS(AVG) from 6.3.15.5.2)
+00001	ENTR
VERB 33	ENTR

6.3.15.22 Verify that VERB 01 NOUN 71 flashes and R1 = 00110.

6.3.15.23 On K-148 enter the following:

VERB 21	ENTR
00210	ENTR
VERB 33	ENTR

6.3.15.24 VERB 54 NOUN 71 shall flash and R1 = 00210.

6.3.15.25 On Computer Control and Reticle Dimming Assembly, press the MARK X pushbutton.

6.3.15.26 Verify VERB 06 NOUN 79 flashing. The DSKY display shall be:

R1 = XXX.XX (Cursor Angle)
R2 = XXX.XX (Spiral Angle)
R3 = XXXXX (Position Code)

6.3.15.27 On K-148 enter the following sequence:

VERB 25	ENTR
±XXX.XX	ENTR (FY(AVG) from 6.3.15.7.2)
±XXX.XX	ENTR (FS(AVG) from 6.3.15.8.2)
+00002	ENTR
VERB 33	ENTR

6.3.15.28 When VERB 06 NOUN 05 flashes, record R1. R1 shall not exceed 0±.08°.

6.3.15.29 On K-148 enter the following:

VERB 36 ENTR
VERB 25 NOUN 07 ENTR
01303 ENTR
00040 ENTR
00001 ENTR

6.3.16 Flight Rope Fixed Memory Bank Sum Check

NOTE: Before proceeding with this test, obtain a Computer Program listing of the flight program being tested. Prepare a list of the bank CKSM bugger words.

6.3.16.1 Verify G&N System in Standby Mode.

6.3.16.2 On K-148 enter the following sequence:

Press ERR RSET
VERB 91 ENTR
Observe VERB 05 NOUN 01 flashing

6.3.16.3 Record the CRT DSKY display indications.

Row 1 = AAAAA	Bank Sum
Row 2 = 000BB	Bank Number
Row 3 = CCCCC	(Bank CKSM bugger word)

Row 1 shall be the same as or the complement of the number displayed in Row 2. Row 3 Indication shall be the same as the bugger word recorded above for the bank tested.

6.3.16.4 On K-148 enter VERB 33 ENTR

6.3.16.5 Repeat paragraphs 6.3.16.3 and 6.3.16.4 until all memory bank sums have been checked.

6.3.16.6 On K-148 enter VERB 34 ENTR.

6.3.17 RR/CDU Control Test

NOTE: RR CDU testing requires that the Rendezvous Radar is operating. The Rendezvous Radar is not activated until Integrated Testing. To insure that the RR CDU's are operating properly, the minimum requirements for RR CDU testing are presented here so that they may be included as part of the requirements to be demonstrated at the first opportunity after Rendezvous Radar activation.

6.3.17.1 Initialization

6.3.17.1.1 Verify the appropriate K-START Tape for RR CDU I/F Test is on the K-START Tape Reader. The tape numbers and their associated Flight Ropes are found in Appendix II.

6.3.17.1.2 Start the Tape Reader.

6.3.17.1.3 When the Tape Reader stops, verify the following on the CRT DSKY:

R1 = +YYYYY (The value of YYYYY is Flight Rope dependent and is found in Appendix II)

R2 = +10549 (Tape Number)

R3 = -YYYZX (Z is the Revision to the Rope Revision number and X is the Tape Revision number.)

6.3.17.1.4 Start the Tape Reader.

6.3.17.1.5 When the Tape Reader stops, press KEY RELEASE. Verify the NO ATT light on the DSKY is lit. Wait 25 seconds before proceeding.

6.3.17.2 CDU Fine and CDU Coarse Error

6.3.17.2.1 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
CG3311	Shaft CDU Fine Error
CG3312	Shaft CDU Coarse Error
CG3321	Trunnion CDU Fine Error
CG3322	Trunnion CDU Coarse Error

6.3.17.2.2 Start the Tape Reader.

6.3.17.2.3 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 Flashing
R1 = 00006
R2 = 00002

6.3.17.2.4 Start the Tape Reader.

6.3.17.2.5 The Tape Reader stops. VERB 41 will be displayed and the rest of the DSKY will blank.

6.3.17.2.6 Before proceeding, verify on CRT that RR CDU Trunnion and Shaft angles indicate +045.00±000.30 degrees.

6.3.17.2.7 Verify the following signals on the CRT:

RR Shaft 1X sin (GG 3304)	+18.4±1.84V RMS
RR Shaft 1X cos (GG 3305)	+18.4±1.84V RMS
RR Trunnion 1X sin (GG 3324)	+18.4±1.84V RMS
RR Trunnion 1X cos (GG 3325)	+18.4±1.84V RMS

6.3.17.2.8 Verify RR CDU Fine Errors (GG 3311, GG 3321) do not exceed 0.07 volts.

6.3.17.2.9 Verify RR CDU Coarse Errors (GG 3312, GG 3322) do not exceed 0.68 volts.

6.3.17.2.10 Start the Tape Reader.

6.3.17.2.11 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 Flashing
R1 = 00006
R2 = 00002

6.3.17.2.12 Start the Tape Reader.

6.3.17.2.13 The Tape Reader stops. VERB 41 is displayed and the rest of the DSKY will blank.

6.3.17.2.14 Wait 60 seconds. Verify on CRT that RR CDU Trunnion angle indicates +180.00±002.00 degrees, and Shaft angle indicates +320.00±002.00 degrees.

6.3.17.2.15 Start the Tape Reader.

6.3.17.2.16 The Tape Reader stops. Wait until the DSKY blanks before proceeding.

6.3.17.2.17 Start the Tape Reader.

6.3.17.2.18 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 Flashing
R1 = 00006
R2 = 00002

6.3.17.2.19 Start the Tape Reader.

6.3.17.2.20 The Tape Reader stops. VERB 41 is displayed and other DSKY displays blank.

6.3.17.2.21 Wait 30 seconds. Verify on the CRT that RR CDU Shaft and Trunnion angles indicate 000.00±000.30 degree.

6.3.17.2.22 Start the Tape Reader.

6.3.17.2.23 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 Flashing
R1 = 00006
R2 = 00002

6.3.17.2.24 Start the Tape Reader.

6.3.17.2.25 The Tape Reader stops. VERB 41 is displayed and the rest of the DSKY blanks.

6.3.17.2.26 Wait 10 seconds. Verify on the CRT that RR CDU Shaft and Trunnion angles indicate +315.00±000.30 degree.

6.3.17.3 RR CDU Fail Test (Fine)

6.3.17.3.1 Start the Tape Reader.

6.3.17.3.2 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 Flashing
R1 = 00006
R2 = 00002

6.3.17.3.3 Start the Tape Reader.

6.3.17.3.4 The Tape Reader stops. VERB 41 is displayed and the rest of the DSKY blanks.

6.3.17.3.5 Wait 10 seconds before proceeding to next step.

6.3.17.3.6 Start the Tape Reader.

6.3.17.3.7 When the Tape Reader stops, verify RR CDU Fail and Tracker Alarms come ON in approximately 10 seconds.

6.3.17.3.8 Start the Tape Reader.

6.3.17.3.9 The Tape Reader stops. Press the error reset pushbutton (RSET) and verify RR CDU Fail and Tracker Alarms are OFF.

6.3.17.3.10 Start the Tape Reader.

6.3.17.3.11 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 Flashing
R1 = 00006
R2 = 00002

6.3.17.3.12 Start the Tape Reader.

6.3.17.3.13 When the Tape Reader stops, verify RR CDU Fail and Tracker Alarms come ON in approximately 10 seconds.

6.3.17.3.14 Start the Tape Reader.

6.3.17.3.15 The Tape Reader stops. Press the error reset pushbutton (RSET) and verify RR CDU Fail and Tracker Alarms are OFF.

6.3.17.4 RR CDU Fail Test (Coarse)

6.3.17.4.1 Start the Tape Reader.

6.3.17.4.2 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 Flashing
R1 = 00006
R2 = 00002

6.3.17.4.3 Start the Tape Reader.

6.3.17.4.4 When the Tape Reader stops, verify RR CDU Fail and Tracker Alarms come ON in approximately 10 seconds.

6.3.17.4.5 Start the Tape Reader.

6.3.17.4.6 The Tape Reader stops. Press the error reset pushbutton (RSET) and verify that RR CDU Fail and Tracker Alarms are OFF.

6.3.17.4.7 Start the Tape Reader.

6.3.17.4.8 When the Tape Reader stops, verify the following:

VERB 04 NOUN 12 Flashing
R1 = 00006
R2 = 00002

6.3.17.4.9 Start the Tape Reader.

6.3.17.4.10 When the Tape Reader stops, verify RR CDU Fail and Tracker Alarms come ON in approximately 10 seconds.

6.3.17.4.11 Start the Tape Reader.

6.3.17.4.12 The Tape Reader stops.. Press the error reset pushbutton (RSET). Verify RR CDU Fail and Tracker Alarms are OFF.

6.3.17.4.13 Start the Tape Reader.

6.3.17.4.14 When the Tape Reader stops, the DSKY blanks.

APPENDIX I

MEASUREMENT TOLERANCES

Signal	Link	Signal Name	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
GG 1020	4*	+14 vdc LGC Supply	14.0±0.4 vdc	0%
GG 1030	4	+4 vdc LGC Supply	4.0±0.2 vdc	0%
GG 1040	5**	+120 vdc PIPA Supply	120±6.0 vdc	1%
GG 1070	4	+4 vdc CDU Supply	4.0±0.2 vdc	0%
GG 1100	4	-28 vdc Supply	-27.5±6.0 vdc	0%
GG 1110	5	2.5 vdc Telemetry Bias No. 1	2.5±.06 vdc	0%
GG 1201	5	IMU 28V 800 cps 1%	28.00±0.56V rms	1%
GG 1202	4	IMU 28V 800 cps 5%	28.0±1.4V rms	0.33%
GG 1203	4	IMU 28V 800 cps 5%	28.0±2.1V rms	0.33%
GG 1331	5	3.2 kc 28V Supply 1%	28.6±0.56V rms	1%
GG 1500	4	+28 vdc IMU OPER BUS	28.0-3.5, +5.5 vdc	0%
GG 1510	4	+28 vdc IMU STBY BUS (Stby mode)	28.0-6.0, +5.5 vdc	0%
GG 1513X	5	+28 vdc IMU STBY/OFF	28.0±1 vdc	0%
GG 1520	4	+28 vdc LGC OPER BUS	28.0±4.5 vdc	0%
GG 1523X	5	+28 vdc LGC Operate	28.0±1 vdc	0%
GG 2001	5	X PIPA S.G. OUT IN PH	Output ±0.3V rms but not 0.0	3%
GG 2021	5	Y PIPA S.G. OUT IN PH	Output ±0.3V rms but not 0.0	3%
GG 2041	5	Z PIPA S.G. OUT IN PH	Output ±0.3V rms but not 0.0	3%
GG 2106	4	IG Servo Error Total	0.0±60 MV rms at null	1%
GG 2110	4	IG Torque Motor Current	0.125 AMP Max during any fine Align Torque	0%
GG 2112	5	IG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 2113	5	IG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 2136	4	MG Servo Error Total	0.0±60 MV rms at null	1%
GG 2140	4	MG Torque Motor Current	0.125 AMP Max during any fine Align Torque	0%
GG 2142	5	MG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 2143	5	MG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 2166	4	OG Servo Error Total	0.0±60 MV rms at null	1%
GG 2170	4	OG Torque Motor Current	0.125 AMP Max during fine Align Torque	0%
GG 2172	5	OG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 2173	5	OG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 2219	5	Pitch Attitude Error	5.05±0.5V rms at 17°	0.67%
GG 2221	4	IG CDU Coarse Error	0.0±0.68V rms at null	0.29%
GG 1510	4	+28 vdc IMU STBY BUS (Oper. mode)	28.0-4.5, +4.5 vdc	0%

* Link 4 - PSAAM Output Signal

** Link 5 - SCA Output Signal

APPENDIX I (Continued)

Signal	Link	Signal Name	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
GG 2249	5	YAW Attitude Error	5.05±0.5V rms at 17°	0.67%
GG 2251	4	MG CDU Coarse Error	0.0±0.68V rms at null	0.29%
GG 2279	5	Roll Attitude Error	5.05±0.5V rms at 17°	0.67%
GG 2281	4	OG CDU Coarse Error	0.0±0.68V rms at null	0.29%
GG 2300	5	PIPA Temperature	130.5±1.5°F in Operate	2%
GG 2302	4	IMU Heater Current On	28±1 vdc	0%
GG 3304	5	RR Shaft 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 3305	5	RR Shaft 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 3312	4	RR Shaft CDU Coarse Error	0.0±0.68V rms at null	1%
GG 3322	4	RR Trunnion CDU Coarse Error	0.0±0.68V rms at null	1%
GG 3324	5	RR Trunnion 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 3325	5	RR Trunnion 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 4300	4	LGC Temperature	+47 to +122°F	0.23%
GG 6020	4	PIPA Calibration Module Temperature	+47 to +90°F	0.23%
GG 6021	4	PSA Temperature	85±25.0°F	0%
NG 1336	4	PHDIFF 3.2KC 28V/LGC SYNC	0° ±10°	3%
NG 1021	4	14 VDC LGC Noise RMS	0.2 VRMS Max	0%
NG 1022	4	14 VDC LGC Noise Peak	5 volts with rise time of 2 to 5 μsec	0%
NG 1031	4	4 VDC LGC Noise RMS	0.2 VRMS Max	0%
NG 1032	4	4 VDC LGC Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1071	4	4 VDC CDU Noise RMS	0.1 VRMS Max	0%
NG 1072	4	4 VDC CDU Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1501	4	28 VDC IMU Operate Noise RMS	1.0 VRMS Max	0%
NG 1502	4	28 VDC IMU Operate Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1511	4	28 VDC IMU Standby Noise RMS	1.0 VRMS Max	0%
NG 1512	4	28 VDC IMU Standby Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1521	4	28 VDC LGC Operate Noise RMS	2.0 VRMS Max	0%
NG 1522	4	28 VDC LGC Operate Noise Peak	5.0 volts with rise time of 2 to 50 μsec	0%

APPENDIX II, SECTION A
K-START TAPE INFORMATION

Name	Number*	Program	R1=YYYYY R1 Display
LM Self-Check Test	F10L004-K10538-XX	Luminary 69	10069
LM G/N OPCHK	F10L004-K10531-XX		10069
LM Semi-Automatic Mode Test	F10L004-K10530-XX		10069
IRIG Scale Factor Test	F10L004-K00081-XX		10069
IMU Performance Test	F10L004-K00083-XX		10069
Alarms and Interrupts Test	F10L004-K10545-XX		10069
LM Self-Check Test	F10L005-K10538-XX	Luminary 99	10099
LM G/N OPCHK	F10L005-K10531-XX		10099
LM Semi-Automatic Mode Test	F10L005-K10530-XX		10099
IRIG Scale Factor Test	F10L005-K00081-XX		10099
IMU Performance Test	F10L005-K00083-XX		10099
LM Self-Check Test	F10L006-K10538-XX	Luminary 116	10116
LM G/N OPCHK	F10L006-K10531-XX		10116
LM Semi-Automatic Mode Test	F10L006-K10530-XX		10116
IRIG Scale Factor Test	F10L006-K00081-XX		10116
IMU Performance Test	F10L006-K00083-XX		10116
Alarms and Interrupts Test	F10L006-K10545-XX		10116

*NOTE: Where XX is the revision number.

APPENDIX II SECTION B

NEW TAPE NUMBER FORMAT

NAME	NUMBER	PROGRAM	R1	R3
RR CDU I/F Test	F10L0991-K10549-X	Luminary 99	+10099	-YYY1X
LM Self-Check Test	F10L1300-K10538-X	Luminary 130	+10130	-YYY0X
LM G/N OPCHK	F10L1300-K10531-X	↓	+10130	-YYY0X
LM Semi-Automatic Mode Test	F10L1300-K10530-X		+10130	-YYY0X
IRIG Scale Factor Test	F10L1300-K00081-X		+10130	-YYY0X
IMU Performance Test	F10L1300-K00083-X		+10130	-YYY0X
Alarms and Interrupts Test	F10L1300-K10545-X		+10130	-YYY0X
Alms & Int Test/Restrt Mon	F10L1300-K10550-X		+10130	-YYY0X
RR CDU I/F Test	F10L1300-K10549-X		+10130	-YYY0X

NOTE: X is the tape revision number. YYY is the spacecraft number (only assigned to MIT Mission E-Memory Load Tapes). The Revision to the Rope Revision number is found in the R3 display, second digit from right.

ADDENDUM I

SCOPE: The following changes are required to make ND1002380 applicable as G&N System technical support documentation for systems containing LUMINARY 131 flight ropes.

Change 1: Paragraphs 6.2.2.4.1, 6.3.1.5.3.3, 6.3.1.5.3.3.1, 6.3.1.5.3.3.2, 6.3.1.5.3.3.3, 6.3.1.5.3.3.4

In each of these paragraphs, change the address entry from 01036 to 01035.

Change 2: Paragraphs 6.2.4.24, 6.3.6.5, 6.3.7.25, 6.3.9.21, 6.3.12.3.18

In each of these paragraphs, change the address entry from 01303 to 01300.

ADDENDUM II

(This addendum deleted)

ADDENDUM III

(This addendum deleted)

ADDENDUM IV

(This addendum deleted)

APOLLO G&N Specification
ND1002380
Original Issue Date: 29 AUG 68
Release Authority: TDRR 36763
Class A **Release**

POST INSTALLATION CHECKOUT PROCESS SPECIFICATION FOR LM G&N SYSTEM (KSC) WITH LUMINARY FLIGHT ROPES

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				AC	NASA

This specification consists of page 1 to 109 inclusive.

APPROVALS	NASA/MSC	MIT/IL	CCA	AC

1.0 INTRODUCTION

1.1 The individual Spacecraft (SC) installed Guidance and Navigation (G&N) System to be checked out per this process specification shall consist of one of each of the following major assemblies. The applicable part numbers shall be determined by Drawing No. 6014999.

Assembly Name

1 - Apollo Guidance Computer Group

1 - Inertial Meas. Unit & Pulse Torque Assembly

1 - Coupling Data Unit

1 - Power and Servo Assembly

1 - Computer Control & Reticle Dimmer Assembly

1 - G&N Interconnect Harness Assembly (LEM)

1 - Signal Conditioner Assembly

1 - Navigation Base Assembly (LEM)

1 - Alignment Optical Telescope (LEM)

1.2 The G&N System herein shall be identified as a LM system. The computer contains the program flight ropes in the core rope memory. The test requirements herein are based on LUMINARY 26 flight programs.

2.0 SCOPE

2.1 This specification outlines the checkout requirements for G&N System installed in a Lunar Module Vehicle. Addendum to this specification will cover any special check-out requirements associated with individual vehicles, G&N Systems and Computer Flight Programs.

5.6.1 (Cont) Checkout Equipment (ACE) for the Power and Servo Assembly Adapter Module (PSAAM) and Signal Conditioner Assembly (SCA) performance. PSAAM and signal conditioner stability uncertainties are included in Appendix I.

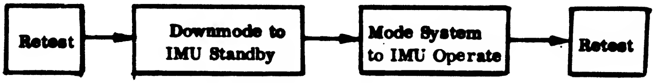
5.6.2 In the event of a conflict between requirements, the following order of precedence shall apply. The contractor shall also notify AC Electronics Site Manager of the conflict.

a. The contract
b. The Specification
c. Documents referenced in this specification.

5.7 Retest Requirements

5.7.1 IRIG and PIPA data (See Paragraph 6.3.9)

5.7.1.1 If D_1, D_2, or D_3 exceeds its maximum value as specified in 6.3.9 for any IRIG or PIPA, a retest sequence shall be initiated as indicated below:



RETEST SEQUENCE

The retest sequence shall be performed using the paragraphs indicated in Table I corresponding to the out-of-spec parameters. Table II indicates the test positions and other isolated parameters that must be recalculated and qualified.

If D_1, D_2, and D_3 are within tolerance after the retest sequence is completed, the original out-of-tolerance terms calculated in 6.3.9.22.5 shall be exonerated.

5.7.1.2 Failure to be within the maximum values of D_1, D_2 and D_3 after the retest sequence of 5.7.1.1 shall constitute a failure of the assembly.

5.7.1.3 If authority has been obtained to degauss a PIPA, then data taken prior to the degaussing of that PIPA shall not be used in the future to calculate stability terms. After degaussing, the retest sequence of Paragraph 5.7.1.1 must be performed.

5.7.2 Failure of the G&N System to pass any examination or test specified herein shall tentatively classify the G&N system as non-conforming. Normal test sequence may be continued upon determination of the cause of the nonconformance or at the discretion of the G&N contractor test team if it is determined that such action is not detrimental to the G&N System or other interfacing subsystems. All nonconformances shall be investigated and cleared by waivers (F.N.N), correction of specification, or hardware replacement and retest. The suspected malfunctioned hardware shall be removed and returned to the laboratory where the malfunction shall be verified. Only after malfunction verification shall a flight certified replaceable element be installed in the G&N System.

TABLE III

RETEST MATRIX

aragraph umber	Test Title	LGC	IMU	PSA	CDU	RR-CDU	PTA	DSKY	A HARNESS	B HARNESS	Computer Control & Reticle Dimmer	Nav Base	Alignment Optical Telescope	Signal Conditioner
.3.1	Standby Power On Test	X	X	X				X	X	X		X		
.3.2	Alarms and Interrupts Test	X						X	X					
.3.3	IMU Operate Power on Test		X	X	X	X	X		X	X		X		X
.3.4	Temperature Control Verification		X	X					X	X		X		X
.3.5	PGNCS Power Supply Test			X	X	X	X		X	X		X		X
.3.6	G&N Operational Test	X	X	X	X	X	X		X	X		X		
.3.7	Semi-Automatic Mode Test		X	X	X				X	X		X		X
.3.8	IRIG Scale Factor Test		X	X			X		X	X		X		
.3.9	IMU Performance Test		X	X			X		X	X		X		
.3.10	LGC Voltage Margin Test	X							X					
.3.11	LGC Clock Frequency Test	X							X		X			
.3.12	Gimbal Friction Test		X	X					X	X		X		X
.3.13	Stabilization Loop Response Test		X	X			X		X	X		X		
.3.14**	G&N Fine Alignment Test		X										X	
.3.15	AOT Functional Performance Test												X	
.3.16	Flight Rope Fixed Memory Bank Sum Check	X							X					
.3.17	RR/CDU Control Test					X								
2.1	Emergency Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*	*
2.2	Normal Shutdown Procedure	*	*	*	*	*	*	*	*	*	*	*	*	*
2.3	Initial Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*	*
2.4	General Turn-On Procedure	*	*	*	*	*	*	*	*	*	*	*	*	*

To be used as necessary to turn system on or off.

* Procedure from Specification ND1002323 with AURORA 88 ropes installed.

6.0 DETAILED REQUIREMENTS

6.1 Initial Test Conditions

6.1.1 The IMU shall be supplied with heater power on a continuous basis. The portable temperature controller (Model No. 410-31058) shall be connected at all times although heater power may be supplied from the +28 VDC IMU STANDBY bus and monitored through ACE.

6.1.2 The IMU shall never be without heater power longer than 15 minutes.

6.2 Operational Requirements

6.2.1 Emergency Shutdown Procedure

CAUTION: In the event of any malfunction which might damage the G&N System before the normal shutdown procedure in 6.2.2 can be performed, power shall be removed from the G&N System as soon as possible. If at all possible, without creating any delay, IMU Operate Power should be removed first.

6.2.2 Normal Shutdown Procedure

6.2.2.1 The normal shutdown of a G&N System shall include parking the gimbals prior to removing IMU Operate Power. This is accomplished in the following procedure.

6.2.2.2 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.2.2.3 On the CRT, verify the following platform angles are displayed:

IG is between 357 and 003 degrees
MG is between 087 and 093 degrees
OG is between 357 and 003 degrees
Verify GIMBAL LOCK lamp is lit

6.2.2.4 Pull out +28 VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11 to remove IMU OPERATE power.

6.2.2.4.1 On K-148 enter the following:

VERB 21 NOUN 01 ENTR
00034 ENTR
00000 ENTR
Verify GIMBAL LOCK lamp is OFF.

6.2.2.4.1 (Cont)
VERB 21 NOUN 01 ENTR
01036 ENTR
40000 ENTR
Verify NO ATT lamp is OFF

6.2.2.5 Pull out +28 VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11 to remove LGC OPERATE power.

6.2.2.6 Pull out +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11 to remove IMU STANDBY power.

6.2.3 Initial Turn-On Procedure

6.2.3.1 The initial power turn-on sequence shall be in the order specified in the test procedures (6.3) observing all cautions and delays as specified.

6.2.4 General Turn-On Procedure

6.2.4.1 This step shall be effective only after having completed the initial turn-on procedures.

6.2.4.2 Proper coolant flow shall be verified.

6.2.4.3 Depress +28 VDC IMU STANDBY circuit breaker on LEM Cabin Panel 11 to supply IMU STANDBY power. Record time.

6.2.4.4 Depress +28 VDC LGC OPERATE circuit breaker on LEM Cabin Panel 11 to supply LGC OPERATE power. The Restart lamp may come on; if it does, press RSET on the DSKY.

6.2.4.5 On K-148, enter the following:

VERB 36 ENTR

6.2.4.6 Verify K-START tape F10L004-K10538-XX LM Self Check Test is on the K-START tape reader, where XX equals tape revision number.

6.2.4.7 Start tape reader.

6.2.4.8 When tape reader stops, verify:

R1 = +10XXX
R2 = +10538 (tape number)
R3 = 000XX (tape revision number)

6.2.4.9 Start tape reader.

6.2.4.10 When tape reader stops, verify:

R1 = 00101

6.2.4.11 Start tape reader

6.2.4.12 Monitor DSKY until R2 (SCOUNT+1) increments twice. If an error is detected, the PROG alarm lamp on the DSKY shall light.

6.2.4.13 On K-148 enter the following to turn off Self-Check:

VERB 21 NOUN 27 ENTR
00000 ENTR
VERB 34 ENTR

6.2.4.14 CAUTION: LGC OPERATE and IMU STANDBY power must have been applied a minimum of two hours before energizing the IMU OPERATE circuit breaker in Step 6.2.4.19, unless all of the following conditions are met:

IF: 1. The G&N System has previously been in Standby Mode at least two hours and subsequently been in Operate Mode, AND

2. The gimbals are placed in a parked position prior to shutdown, AND

3. The shutdown period did not exceed 5 days, AND

4. The Spacecraft or IMU have not been moved in any way during the shutdown period.

THEN: The two-hour Standby Mode operation requirement is reduced to 15 minutes.

6.2.4.15 The G&N System is defined as being in Standby Mode when LGC OPERATE and IMU STANDBY power is applied and IMU OPERATE power is off. The inertial components shall have suspension power in Standby Mode.

6.2.4.16 The G&N System is defined as being in Operate Mode when LGC OPERATE, IMU STANDBY and IMU OPERATE power are applied to the system.

6.2.4.17 Set up analog recorder to monitor the following signals:

Signal No.	Signal Name
a. GG 2136	MG Servo Error Total
b. GG 2106	IG Servo Error Total
c. GG 2166	OG Servo Error Total
d. GG 2112	IG 1X Resolver Sine
e. GG 2172	OG 1X Resolver Sine
f. GG 2142	MG 1X Resolver Sine
g. GG 1201	IMU 28V 1% 800 CPS

6.2.4.18 On CRT, monitor +120 VDC PIPA SUPPLY (GG 1040) and IMU Gimbal angles. Record time. If 15 minutes have elapsed since performing Paragraph 6.2.4.3, proceed to the next paragraph.

6.2.4.19 Press in +28 VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11. Record time.

6.2.4.20 Verify on the analog recorder that the oscillations of the resolver sine signals (GG 2112, GG 2172, and GG 2142) are not sustained and that the signals damp out within 15 seconds. If this condition is not attained, remove IMU OPERATE power immediately.

6.2.4.21 On the CRT, verify absence of +120 VDC PIPA SUPPLY voltage for 90±10 seconds after Step 6.2.4.20 is initiated. Verify that this voltage is between 114 and 126 after 100 seconds from Step 6.2.4.20.

6.2.4.22 Verify that LGC Warning and ISS Warning lamps in the LM cabin are OFF.

6.2.4.23 On the CRT, verify all IMU Gimbal angles are between 357 and 003 degrees.

6.2.4.24 On K-148, enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.2.4.25 On the CRT, scan the power supply voltages to verify their normal operation. (No indications flashing.)

6.2.4.26 After all the tests of 6.3 have been completed, the General Turn-On Procedure (6.2.4) and IMU Operational Test (6.3.6) shall be completed before rerunning any test. Otherwise, the testing sequence shall continue in accordance with Figure 1.

6.2.5 Interruption of Power.

6.2.5.1 IMU Operate power shall never be applied without the presence of LGC Operate and IMU Standby Power.

6.2.5.2 The G&N System log book shall include the gimbal positions at time of power shutdown. If omitted, it shall be assumed that the gimbals were not parked prior to shutdown. The log book shall also state if any movement of the IMU or Spacecraft has taken place after shutdown. The times of application and removal of any bus power to the G&N System shall be recorded.

6.2.5.3 After the system has been operating with IMU Operate power on, and a power interruption occurs, immediately set the IMU Operate power circuit breaker to OFF. When power is restored a minimum of 15 minutes operation in Standby Mode is required before resuming IMU Operate power. If the power interruption lasted longer than 15 minutes, the G&N System shall be run in Standby Mode for a time interval at least equal to the duration power was off before resuming IMU Operate power. However, this period need not exceed two hours before application of IMU Operate power.

6.2.6 Warmup Period

A warmup period of at least one hour in Operate Mode is required prior to performing any test in which gyro or accelerometer parameters are measured, and at least 15 minutes prior to any test in which precision amplitude and frequency power supply checks are made.

6.3 Test Procedures

6.3.1 Standby Power On Tests

6.3.1.1 The Portable Temperature Controller, Model No. 400-31058 shall be supplying inertial component heater power to the G&N System through connector 56J1 (P230). If alarm or fail indications are present on the PTC, they shall be cleared by depressing the SYSTEM RESET pushbutton on the PTC.

6.3.1.2 The following switches and/or circuit breakers shall be closed to energize the indicated buses. On Panel 5 rotate ANUN/NUM dimmer to minimum discernable brightness. On Panel 5 set the LIGHTING OVERRIDE switch to OFF.

LOCATION	NOMENCLATURE	IDENTIFICATION
Panel 14	BAT 5 NORMAL FEED	4S10
Panel 14	BAT 6 NORMAL FEED	4S11
Panel 16	X LUNAR BUS TIE	4CB5
Panel 16	BAT 1-4-6 FEED TIE	4CB17
Panel 16	BAT 2-3-5 FEED TIE	4CB25
Panel 16	ASC ECA	4CB14
Panel 16	ASC ECA CONT.	5CB7
Panel 16	DC BUS VOLT	4CB21
Panel 16	DISP.	4CB16
Panel 11	X LUNAR BUS TIE	4CB4
Panel 11	BAT 1-4-6 FEED TIE	4CB18
Panel 11	BAT 2-3-5 FEED TIE	4CB26
Panel 11	ASC ECA	4CB15
Panel 11	ASC ECA CONT.	4CB6
Panel 11	DC BUS VOLT	4CB22

6.3.1.2 (Continued)

LOCATION	NOMENCLATURE	IDENTIFICATION
Panel 16	INV. NO. 2	4CB13
Panel 14	AC PWR to INV 2 Position	4S14
Panel 11	AC BUS FEED TIE	4CB24
Panel 11	AC BUS VOLT	4CB27
Panel 11	LTG ANUN/DOCK COMP	4CB146
Panel 16	LTG ANUN/DOCK COMP	4CB148

6.3.1.3 IMU Standby Power Turn On

6.3.1.3.1 Press in +28 VDC IMU STANDBY circuit breaker on LM Cabin Panel 11. Record time.

6.3.1.3.2 Verify on the Event Recorder that +28 VDC IMU STANDBY power discrete (GG1513) is on. On CRT +28V IMU STANDBY Bus (GG1510) shall indicate between 22.0 and 33.5.

6.3.1.3.3 The PIPA TEMP, displayed on CRT, shall be monitored periodically for one hour to ensure that the PIPA Temperature Control circuitry is operating to maintain a temperature of 130±5.0 Deg. F. (GG 2300). One hour after performing step 6.3.1.3.2 record PIPA TEMP. The PIPA Temperature shall be 130.5° ±1.5°F.

6.3.1.4 Computer Power Turn On

6.3.1.4.1 Press in +28 VDC LGC OPERATE circuit breaker on LM Cabin Panel 11. RESTART light may be ON, verify LGC Warning is OFF.

6.3.1.4.2 On CRT, +28V LGC Operate Bus (GG 1520) shall indicate between 24.5 and 33.5. Verify on event recorder that +28V LGC OP (GG 1522X) discrete is on. Using DSKY, enter VERB 36 ENTR, then press RSET. All computer alarms shall clear.

6.3.1.4.3 On CRT, the +14 VDC LGC SUPPLY (GG 1020) shall indicate between 13.6 and 14.4 VDC. Record this value.

6.3.1.4.4 On CRT the 28V 3200 CPS SUPPLY (GG 1331) shall indicate between a 26.84 and 29.16 VRMS. Record this value.

6.3.1.5 LGC Operational Tests

6.3.1.5.1 LGC Self-Check.

6.3.1.5.1.1 On K-148, enter the following:

VERB 36 ENTR Wait 10 seconds.

6.3.1.5.1.2 Verify K-START tape F10L004-K10538-XX LM Self-Check Test is on the K-START tape reader, where XX equals tape revision number.

6.3.1.5.1.3 Start tape reader.

6.3.1.5.1.4 When tape reader stops, verify:

R1 = +10XXX
R2 = +10538 (tape number)
R3 = -000XX (tape revision number)

6.3.1.5.1.5 Load E-Memory Program.

6.3.1.5.1.5.1 Start tape reader.

6.3.1.5.1.5.2 When tape reader stops, verify R1 displays +00101.

6.3.1.5.1.6 Initiate Self-Check.

6.3.1.5.1.6.1 Start Tape reader.

6.3.1.5.1.6.2 When R2 = 00002, start tape reader.

6.3.1.5.1.6.3 When tape reader stops, wait 60 seconds.

6.3.1.5.2 DSKY Check.

6.3.1.5.2.1 Start tape reader.

6.3.1.5.2.2 All the electroluminescent elements (PROG, VERB, NOUN, and Row 1, Row 2, Row 3) shall display the decimal number nine (9). Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Rows 1, 2, 3 ⎫
l. VERB-NOUN Flashing ⎬ On concurrently for 5 seconds.
m. COMP ACTY ⎭

6.3.1.5.2.2 (Continued)

n. Plus signs in Row's 1, 2, 3
o. VERB-NOUN Flashing
p. COMP ACTY

On concurrently for 5 seconds.

q. DSKY blanks - - COMP ACTY remains on for approximately 5 seconds and then blanks.

6.3.1.5.2.3 The DSKY pushbuttons shall be checked by entering:

VERB 25 NOUN 01 ENTR
03375 ENTR
+00123 ENTR
-00456 ENTR
-00789 (Do not press ENTR)

The DSKY shall display +00123 in Row 1, -00456 in Row 2, and -00789 in Row 3. Press CLR pushbutton three times on DSKY. Observe that Row 1, Row 2 and Row 3 are blank.

6.3.1.5.2.4 On the DSKY, enter the following sequence:

VERB 16 NOUN 20 ENTR
VERB ENTR
Verify KEY REL Flashing
Press KEY REL, KEY REL shall extinguish

6.3.1.5.3 Lamp Test.

6.3.1.5.3.1 Initiate the Lamp Test by entering in the DSKY:

VERB 35 ENTR

6.3.1.5.3.2 The following DSKY displays shall illuminate for approximately 5 seconds;

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in Row's 1,2,3

On concurrently for approximately 5 seconds

On CAUTION/WARNING panel, the following displays shall illuminate, then extinguish.

LGC
ISS

6.3.1.5.3.2 (Continued) 8's remain in the VERB-NOUN display.
+8's remain in DSKY Row's 1, 2 and 3 display.

6.3.1.5.4 Uplink Check.

6.3.1.5.4.1 On K-START 148, set LOAD/INHIBIT switch to LOAD, set TAPE/KEY switch to KEY, then enter the following:

ERROR RESET
VERB 25 NOUN 01 ENTR
03375 ENTR
+01234 ENTR
-56789 ENTR
+00000 ENTR

6.3.1.5.4.2 Verify the following is displayed on the DSKY.

VERB 23 NOUN 01
R1 +01234
R2 -56789
R3 +00000

6.3.1.5.5 Downlink Check

6.3.1.5.5.1 On CRT DSKY display, verify the following is displayed:

VERB 23 NOUN 01
R1 +01234
R2 -56789
R3 +00000

6.3.1.5.6 LGC Standby Check

6.3.1.5.6.1 On K-148, enter the following:

VERB 37 ENTR
06 ENTR

Observe VERB 50 NOUN 25 flashing.
R1 = 00062 (switch LGC power down)

6.3.1.5.6.2 On DSKY, depress PRO pushbutton for approximately 3 seconds.

6.3.1.5.6.3 Verify STBY status indicator lamp is ON.

6.3.1.5.6.4 On the CRT, verify the 3.2 KC 28V Supply (CG 1331) is between 28.04 and 29.16V RMS.

6.3.1.5.6.5 On DSKY, depress PRO pushbutton for approximately 3 seconds to return to LGC Operate Mode.

6.3.1.5.6.6 Verify STBY status indicator lamp is OFF. RESTART light may be ON. Verify LGC Warning is OFF. VERB 37 will flash.

6.3.1.5.6.7 On DSKY enter the following:

VERB 36 ENTR

6.3.1.5.7 Standby/Proceed Check.

6.3.1.5.7.1 On the DSKY, press and hold the PRO pushbutton, verify CHAN 32 on CRT displays 57777.

6.3.2 Alarms and Interrupts Test

6.3.2.1 Parity Fail Test

6.3.2.1.1 On K-148 enter the following sequence:

VERB 21 NOUN 02 ENTR
03377 ENTR
33777 ENTR

6.3.2.1.2 On CRT, DSKY display, verify R1 = 33777 and R3 = 03377

6.3.2.1.3 On K-148 enter the following sequence

VERB 25 NOUN 26 ENTR
04000 ENTR
01777 ENTR
00006 ENTR
VERB 30 ENTR

6.3.2.1.4 Verify RESTART lamp is ON.

6.3.2.1.5 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.2.2 Rupt Lock-Interrupt Too Long

6.3.2.2.1 On K-148 enter the following sequence:

VERB 24 NOUN 01 ENTR
03376 ENTR
30001 ENTR
01776 ENTR
VERB 25 NOUN 26 ENTR

6.3.2.2.1 (Continued)

00001 ENTR
01776 ENTR
00006 ENTR
VERB 31 ENTR

6.3.2.2.2 Verify RESTART lamp is ON.

6.3.2.2.3 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.2.3 TC Trap Test

6.3.2.3.1 On K-148 enter the following sequence:

VERB 21 NOUN 01 ENTR
03377 ENTR
01777 ENTR
VERB 25 NOUN 26 ENTR
04000 ENTR
01777 ENTR
00006 ENTR
VERB 30 ENTR

6.3.2.3.2 Verify RESTART lamp is ON.

6.3.2.3.3 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.2.4 Nightwatchman Test

6.3.2.4.1 On K-148 enter the following sequence

VERB 24 NOUN 01 ENTR
03376 ENTR
30001 ENTR
01776 ENTR
VERB 25 NOUN 26 ENTR
04000 ENTR
01776 ENTR
00006 ENTR
VERB 30 ENTR

6.3.2.4.2 Verify RESTART lamp is ON.

6.3.2.4.3 On K-148 enter VERB 36 ENTR. Press ERROR RESET pushbutton. All alarms shall clear.

6.3.3 IMU Operate Power On Tests

CAUTION: Prior to application of IMU OPERATE power in step 6.3.3.1.4, LGC OPERATE and IMU STANDBY power must have been applied to the G&N System continuously for a minimum of two hours. The only exception is when the requirements of step 6.2.4.14 are met and this does not apply for the initial application of IMU OPERATE power.

6.3.3.1 Verification of Power Turn-On

6.3.3.1.1 Set up analog recorder to monitor the following signals:

	SIGNAL NO.	SIGNAL NAME
a.	GG 2136	MG Servo Error Total
b.	GG 2106	IG Servo Error Total
c.	GG 2166	OG Servo Error Total
d.	GG 2112	IG 1X Resolver Sine
e.	GG 2172	OG 1X Resolver Sine
f.	GG 2142	MG 1X Resolver Sine
g.	GG 1201	IMU 28V 1% 800 cps
h.	SPARE	

6.3.3.1.2 On CRT, monitor +120 VDC PIPA SUPPLY (GG 1040) and IMU gimbal angles.

6.3.3.1.3 Press in +28 VDC IMU OPERATE circuit breaker on LEM Cabin Panel 11. Record time.

6.3.3.1.3.1 Verify that the "NO ATT" lamp on the DSKY is lighted.

6.3.3.1.4 Verify on analog recorder that the oscillations of the resolver sine signals (GG 2112, GG 2172, and GG 2142) are not sustained and that the signals damp out within 15 seconds. If they don't, remove IMU OPERATE power as soon as possible.

6.3.3.1.5 On the CRT, verify absence of +120 VDC PIPA SUPPLY voltage for 90±10 seconds after step 6.3.3.1.3 is initiated. Verify that this voltage is between 114 and 126 after 100 seconds from step 6.3.3.1.3.

6.3.3.1.6 On event recorder verify the following:

LGC WARNING is OFF (GG 9001)
ISS WARNING is OFF (GG 9002)

6.3.3.1.6.1 On DSKY, verify that the "NO ATT" lamp is off.

6.3.3.1.7 On CRT, verify all IMU gimbal angles indicate approximately 0 degrees.

6.3.3.1.8 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.4 Temperature Control Verification

6.3.4.1 After IMU OPERATE turn-on, periodically check the PIPA TEMP for the next 15 minutes. The PIPA TEMP shall be 130.5±2.0°F. Fifteen (15) minutes after IMU OPERATE turn on the PIPA temperature shall be within 0.5°F of its stabilized value (para 6.3.4.3).

6.3.4.2 When 1 hour has elapsed from the time of IMU OPERATE power turn-on, monitor PIPA TEMP (GG 2300) on the CRT. Monitor and record temperature readings every 5 minutes for 30 minutes. Verify that each reading does not deviate from the average value of each signal by more than 0.1°F.

6.3.4.3 The PIPA Temp shall be 130.5±1.5°F.

6.3.4.4 Verify on the event recorder that IMU Blower Current (GG 2303) and IMU Heater Current (GG 2302) On discretes have been present for the last hour (discretes may cycle off).

6.3.5 PGNCS Power Supply Tests

6.3.5.1 From the CRT, confirm power supply voltages (or temperatures) are as specified and record values observed.

6.3.5.2 The PIPA Calibration Module Temperature (GG 6020) shall be between +45 and +90 DEG F.

6.3.5.3 The PSA Temperature (GG 6021) shall be between +60 and +110 DEG F.

6.3.5.4 The LGC Temperature (GG 4300) shall be between +45 and +130 DEG. F.

6.3.5.5 The +28 VDC IMU OPERATE BUS (GG 1500) shall be between 24.5 and 33.5 VDC.

6.3.5.6 The +28 VDC IMU STANDBY BUS (GG 1510) shall be between 23.5 and 32.5 VDC.

6.3.5.7 The +28 VDC LGC OPERATE BUS (GG 1520) shall be between 24.5 and 33.5 VDC.

6.3.5.8 The +120 VDC PIPA Supply (GG 1040) shall be between 114 and 126 VDC.

6.3.5.9 The -28 VDC Supply (GG 1100) shall be between -21.5 and -33.5 VDC.

6.3.5.10 The +4 VDC CDU Supply (GG 1070) shall be between 3.8 and 4.2 VDC.

6.3.5.11 The IMU 28V 800 CPS 1 pct Supply (GG 1201) shall be between 27.44 and 28.56 VRMS.

6.3.5.12 The IMU 28V 800 CPS 5 pct 90 PH Supply (GG 1202) shall be between 26.6 and 29.4 VRMS.

6.3.5.13 The IMU 28V 800 CPS 5 pct 0 PH Supply (GG 1203) shall be between 25.9 and 30.1 VRMS.

6.3.5.14 The 3.2 KC 28V Supply (GG 1331) shall be between 28.04 and 29.16 VRMS.

6.3.5.15 The 2.5 VDC T/M Bias (GG 1110) shall be between 2.44 and 2.56 VDC.

6.3.5.16 The +14 VDC LGC Supply (GG 1020) shall be between 13.6 and 14.4 VDC.

6.3.5.17 The +4 VDC LGC Supply (GG 1030) shall be between 3.8 and 4.2 VDC.

6.3.5.18 The phase difference between the 3.2 KC supply and LGC sync shall be 0±10° (NG 1336).

6.3.5.19 Record the noise levels of the following signals displayed on the CRT.

Item No.	Measurement No.	Signal	Requirement
a.	NG 1021	14 VDC LGC Noise RMS	<0.2 VRMS
b.	NG 1031	4 VDC LGC Noise RMS	<0.2 VRMS
c.	NG 1071	4 VDC CDU Noise RMS	<0.1 VRMS
d.	NG 1501	28 VDC IMU Operate Noise RMS	<1.0 VRMS
e.	NG 1511	28 VDC IMU Standby Noise RMS	<1.0 VRMS
f.	NG 1521	28 VDC LGC Operate Noise RMS	<2.0 VRMS

6.3.5.20 The noise peaks of the following signals are demonstrated on the event light when the peaks have a rise time between 2 and 50 μsec and the peak

6.3.5.20 (Cont) voltage exceeds 5 volts.

Item No.	Measurement No.	Signal
a.	NG 1022	14 VDC LGC Noise Peak
b.	NG 1032	4 VDC LGC Noise Peak
c.	NG 1072	4 VDC CDU Noise Peak
d.	NG 1502	28 VDC IMU Operate Noise Peak
e.	NG 1522	28 VDC LGC Operate Peak

6.3.5.21 The noise peaks of the following signals are demonstrated on the event light when the peaks have a rise time of between 2 and 50 μsec and the peak voltage exceeds 10 volts.

a.	NG 1512	28 VDC IMU Standby Peak.

6.3.6 G&N Operational Test

NOTE: Manual DSKY entries during this test may result in a test abort.

6.3.6.1 Verify K-START tape F10L004-K10531-XX LM G/N OPCHK is on K-START tape reader, where XX equals tape revision number

6.3.6.1.1 Start tape reader.

6.3.6.1.2 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +10XXX
b. R2 = +10531 (tape number)
c. R3 = -000XX (tape revision number)

6.3.6.2 E-Memory Program Load and Sum Check

6.3.6.2.1 Start tape reader.

6.3.6.2.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00101.

6.3.6.3 Local g Measurement.

6.3.6.3.1 Start tape reader.

6.3.6.3.2 In approximately 10 minutes, VERB 06 NOUN 96 shall flash.

6.3.6.3.3 From the CRT DSKY display read and record Row 1 and Row 2 (local gravity whole and fractional respectively). The value recorded shall be between 975.0 and 985.9 cm/sec^2.

6.3.6.4 Horizontal Earth Rate Measurement

6.3.6.4.1 Press PRO pushbutton on DSKY.

6.3.6.4.2 In approximately 2 seconds VERB 06 NOUN 98 shall flash. From the CRT DSKY display read and record R2 (horizontal component of earth rate acting on X, Y and Z IRIG's). The values recorded shall be between 77882 and 97882.

6.3.6.5 Enter the following on K-148:

VERB 34 ENTR
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.7 Semi-Automatic Mode Test

6.3.7.1 Verify K-START Tape F10L004-K10530-XX LM Semi-Automatic Mode Test is on K-START tape reader, where XX equals tape revision number.

6.3.7.1.1 Start tape reader.

6.3.7.1.2 When tape reader stops verify the following on CRT DSKY

a. R1 = +10XXX
b. R2 = +10530 (tape number)
c. R3 = +000XX (tape revision number)

6.3.7.2 E-Memory Program Load

6.3.7.2.1 Start tape reader.

6.3.7.2.2 When tape reader stops verify the following on CRT DSKY:

R1 = 00101

6.3.7.3 Command Accuracy 0°.

6.3.7.3.1 Start tape reader.

6.3.7.3.2 When tape stops verify that CRT DSKY R1 indicates 00201. Wait 15 seconds.

6.3.7.3.3 Read and record CRT IMU Gimbal angles. The indications shall be 000±003 degrees.

6.3.7.3.4 Read and record CRT CDU angle indications. The indications shall be +000.00±001.50.

6.3.7.4 Command Accuracy 45°.

6.3.7.4.1 Start tape reader.

6.3.7.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00301. Wait 5 seconds.

6.3.7.4.3 Read and record CRT IMU Gimbal angles. The indications shall be 045±003 degrees.

6.3.7.4.4 Read and record CRT CDU angle indications. Indications shall be +045.00±001.50.

6.3.7.5 CDU Repeating Accuracy 45°.

6.3.7.5.1 Start the tape reader.

6.3.7.5.2 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.3.7.6 Command Accuracy 90°.

6.3.7.6.1 Start tape reader.

6.3.7.6.2 When tape reader stops verify that CRT DSKY Row 1 indicates 00501. GIMBAL LOCK lamp will be lit. Wait 5 seconds.

6.3.7.6.3 Read and record CRT indication of IMU Gimbal angles. The indications shall be 090±003 degrees.

6.3.7.6.4 Read and record CRT CDU angle indications. Indications shall be +090.00±001.50.

6.3.7.7 Command Accuracy 135°.

6.3.7.7.1 Start tape reader.

6.3.7.7.2 When tape reader stops verify CRT DSKY Row 1 indicates 00601. Wait 5 seconds.

6.3.7.7.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 135±003 degrees.

6.3.7.7.4 Read and record CRT CDU angle indications. Indications shall be +135.00±001.50.

6.3.7.8 CDU Repeating Accuracy 135°.

6.3.7.8.1 Start tape reader.

6.3.7.8.2 When tape reader stops verify CRT DSKY Row 1 indicates 00701. Wait 10 seconds, verify GIMBAL LOCK lamp on DSKY is not lit.

6.3.7.8.3 Start tape reader.

6.3.7.8.4 Approximately 5 seconds after tape reader stops VERB 05 NOUN 01 will flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.3.7.9 Plus Gimbal Lock Test.

6.3.7.9.1 Start tape reader.

6.3.7.9.2 When tape reader stops wait approximately 10 seconds. Verify CRT DSKY Row 1 indicates 01101. Verify GIMBAL LOCK lamp is lit.

6.3.7.10 Command Accuracy 225°.

6.3.7.10.1 Start tape reader.

6.3.7.10.2 When tape reader stops verify CRT DSKY Row 1 indicates 01201. GIMBAL LOCK lamp will be lit. Wait 15 seconds.

6.3.7.10.3 Read and record CRT indications of IMU Gimbal angles. Indications shall be 225±003 degrees.

6.3.7.10.4 Read and record CRT CDU angle indications. Indications shall be +225.00±001.50.

6.3.7.11 CDU Command Rate Test

6.3.7.11.1 Start tape reader.

6.3.7.11.2 When tape reader stops verify CRT DSKY display Row 1 indicates 01301. Wait 10 seconds. Verify IMU Gimbals are at approximately 0°.

6.3.7.11.3 Middle Gimbal Rate Test

6.3.7.11.3.1 Start tape reader.

6.3.7.11.3.2 When tape reader stops immediately verify display of 01401 in Row 1 of CRT DSKY display. In approximately 12 seconds VERB 23 NOUN 26 shall flash. The GIMBAL LOCK lamp shall be lit. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.3.7.11.4 Inner Gimbal Rate Test

6.3.7.11.4.1 Start tape reader.

6.3.7.11.4.2 Approximately 12 seconds after the tape reader stops VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.3.7.11.5 Outer Gimbal Rate Test.

6.3.7.11.5.1 Start tape reader.

6.3.7.11.5.2 Approximately 12 seconds after the tape reader stops VERB 23 NOUN 26 shall flash. Read and record CRT DSKY Row 1 and Row 2 displays. The recorded value shall be between 0001200000 and 0001600000.

6.3.7.11.6 Start tape reader.

6.3.7.11.6.1 Wait 15 seconds. Verify IMU Gimbals are at approximately 0°.

6.3.7.12 Command Accuracy 315°.

6.3.7.12.1 Start tape reader.

6.3.7.12.2 When tape reader stops verify CRT DSKY Row 1 indicates 01501.

6.3.7.12.3 Read and record CRT IMU Gimbal Angles. Indication shall be 315±003 degrees.

6.3.7.12.4 Read and record CRT CDU angle indications. Indications shall be +315.00±001.50.

6.3.7.13 CDU Repeating Accuracy 315°..

6.3.7.13.1 Start tape reader.

6.3.7.13.2 Approximately 5 seconds after the tape reader stops VERB 05 NOUN 01 shall flash. Read and record CRT DSKY Row 1, 2, and 3 indications. Recorded values shall be between 77770 and 00007.

6.3.7.14 Minus Gimbal Lock Test.

6.3.7.14.1 Start tape reader.

6.3.7.14.2 When tape reader stops verify CRT DSKY Row 1 indicates 01701. Verify GIMBAL LOCK lamp is lit after approximately 5 seconds.

6.3.7.15 CDU Repeating Accuracy 225°.

6.3.7.15.1 Start tape reader.

6.3.7.15.2 When tape reader stops verify CRT DSKY Row 1 indicates +00016. Wait 10 seconds before continuing.

6.3.7.15.3 Start tape reader.

6.3.7.15.4 Approximately 5 seconds after tape reader stops VERB 06 NOUN 01 will flash. Read and record CRT DSKY Row 1, 2 and 3 indications. Recorded values shall be between 77770 and 00007.

6.3.7.16 OG CDU Fine Fail Test.

6.3.7.16.1 Start tape reader.

6.3.7.16.2 When tape reader stops verify CRT DSKY Row 1 indicates 02101.

6.3.7.16.3 Start tape reader.

6.3.7.16.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes, verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.16.5 Start tape reader.

6.3.7.16.6 Approximately 4 seconds after tape reader stops, verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.17 IG CDU Fine Fail Test

6.3.7.17.1 Start tape reader.

6.3.7.17.2 When tape reader stops verify CRT DSKY Row 1 indicates 02201.

6.3.7.17.3 Start tape reader.

6.3.7.17.4 Approximately 10 seconds after the tape reader stops, VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes, verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.17.5 Start tape reader.

6.3.7.17.6 Approximately 4 seconds after tape reader stops, verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.18 MG CDU Fine Fail Test.

6.3.7.18.1 Start tape reader.

6.3.7.18.2 When tape reader stops verify CRT DSKY Row 1 indicates 02301.

6.3.7.18.3 Start tape reader.

6.3.7.18.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify, ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.18.5 Start tape reader.

6.3.7.18.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.19 OG CDU Coarse Fail Test

6.3.7.19.1 Start tape reader.

6.3.7.19.2 When tape reader stops verify CRT DSKY Row 1 indicates 02401.

6.3.7.19.3 Start tape reader.

6.3.7.19.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.19.5 Start tape reader.

6.3.7.19.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.20 IG CDU Coarse Fail Test

6.3.7.20.1 Start tape reader.

6.3.7.20.2 When tape reader stops verify CRT DSKY Row 1 indicates 02501.

6.3.7.20.3 Start tape reader.

6.3.7.20.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.20.5 Start tape reader.

6.3.7.20.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.21 MG CDU Coarse Fail Test

6.3.7.21.1 Start tape reader.

6.3.7.21.2 When tape reader stops verify CRT DSKY Row 1 indicates 02601.

6.3.7.21.3 Start tape reader.

6.3.7.21.4 Approximately 10 seconds after the tape reader stops VERB 30 NOUN 26 will flash. Approximately 4 seconds after VERB 30 NOUN 26 flashes verify ISS Warning lamp and PROG alarm lamp on DSKY are lit. Verify FAILREG on CRT displays 03777.

6.3.7.21.5 Start tape reader.

6.3.7.21.6 Approximately 4 seconds after tape reader stops verify ISS Warning lamp is out. Press ERR RST. PROG alarm lamp shall go out.

6.3.7.22 FDAI Linearity Test.

6.3.7.22.1 Start tape reader.

6.3.7.22.2 When tape reader stops verify that CRT DSKY Row 1 indicates 02701. Wait 5 seconds.

6.3.7.22.3 Start tape reader.

6.3.7.22.4 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates +00017.
PITCH ATT ERROR is between +15.3 and +18.7 DEG (GG 2219)
YAW ATT ERROR is between +15.3 and +18.7 DEG (GG 2249)
ROLL ATT ERROR is between +15.3 and +18.7 DEG (GG 2279)

6.3.7.22.5 Start tape reader.

6.3.7.22.6 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates +00016.
PITCH ATT ERROR is between +14.4 and +17.6 DEG (GG 2219)
YAW ATT ERROR is between +14.4 and +17.6 DEG (GG 2249)
ROLL ATT ERROR is between +14.4 and +17.6 DEG (GG2279)

6.3.7.22.7 Start tape reader.

6.3.7.22.8 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates +00006.
PITCH ATT ERROR is between +05.4 and +06.6 DEG (GG 2219)
YAW ATT ERROR is between +05.4 and +06.6 DEG (GG 2249)
ROLL ATT ERROR is between +05.4 and +06.6 DEG (GG 2279)

6.3.7.22.9 Start tape reader.

6.3.7.22.10 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates +00000.
PITCH ATT ERROR is between +00.2 and -00.2 DEG (GG 2219)
YAW ATT ERROR is between +00.2 and -00.2 DEG (GG 2249)
ROLL ATT ERROR is between +00.2 and -00.2 DEG (GG 2279)

6.3.7.22.11 Start tape reader.

6.3.7.22.12 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates -00006.
PITCH ATT ERROR is between -05.4 and -06.6 DEG (GG 2219)
YAW ATT ERROR is between -05.4 and -06.6 DEG (GG 2249)
ROLL ATT ERROR is between -05.4 and -06.6 DEG (GG 2279)

6.3.7.22.13 Start tape reader.

6.3.7.22.14 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates -00016.
PITCH ATT ERROR is between -14.4 and -17.6 DEG (GG 2219)
YAW ATT ERROR is between -14.4 and -17.6 DEG (GG 2249)
ROLL ATT ERROR is between -14.4 and -17.6 DEG (GG 2279)

6.3.7.22.15 Start tape reader.

6.3.7.22.16 VERB 23 NOUN 26 shall flash. On CRT verify the following:

CRT DSKY Row 1 indicates -00017.
PITCH ATT ERROR is between -15.3 and -16.7 DEG (GG 2219)
YAW ATT ERROR is between -15.3 and -18.7 DEG (GG 2249)
ROLL ATT ERROR is between -15.3 and -18.7 DEG (GG 2279)

6.3.7.23 On K-148 enter VERB 34 ENTER

The proper operation of the IMU CAGE function (consisting of steps 6.3.7.23.1 through 6.3.7.23.7) need be performed only once during the initial PGNCS Operational Test and omitted from subsequent testing of test 6.3.7.

6.3.7.23.1 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00200 ENTR
+00200 ENTR
+00200 ENTR

6.3.7.23.2 Observe that the NO ATT lamp on the DSKY lights and that the CDUX, CDUY and CDUZ angles on the CRT indicate approximately +00200.

6.3.7.23.3 On analog recorder, monitor the following signals:

	Signal No.	Signal Name
a.	GG 2136	MG Servo Error Total
b.	GG 2106	IG Servo Error Total
c.	GG 2166	OG Servo Error Total
d.	GG 2112	IG 1X Resolver Sine
e.	GG 2172	OG 1X Resolver Sine
f.	GG 2142	MG 1X Resolver Sine
g.	GG 1201	IMU 28V 1% 800 cps

6.3.7.23.4 Start analog recorder to a chart speed of 5 mm/sec.

6.3.7.23.5 On LEM Cabin Panel 4, hold IMU CAGE momentary toggle switch in the ON position. (Do not release).

6.3.7.23.6 On analog recorder, verify the 1X Resolver Sine signals (GG 2112, GG 2172, GG 2142) null out to less than 0.5 VRMS. Release IMU CAGE switch to the OFF position. Disregard any momentary transients on the 1X Resolver Sine signals when the switch is released. Any sustained oscillations shall be cause for immediate removal of IMU Operate Power.

6.3.7.23.7 On the CRT, verify that the CDUX, CDUY and CDUZ angles are all between +00150 and +35850.

6.3.7.24 Stop analog recorder.

6.3.7.24.1 On K-148 enter the following:

VERB 36 ENTR wait 10 seconds
VERB 43 ENTR
+01700 ENTR

6.3.7.24.1 (Cont)

+00600 ENTR
-01700 ENTR

On CRT, verify the following:

YAW ATT ERROR is between +15.3 and +18.7 DEG (GG 2249)
PITCH ATT ERROR is between +05.5 and +06.6 DEG (GG 2219)
ROLL ATT ERROR is between -15.3 and -18.7 DEG (GG 2279)

6.3.7.25 On K-148 enter the following:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.8 **IRIG Scale Factor Test**

6.3.8.1 Verify K-START Tape F10L004-K00063-XX IRIG Scale Factor Test is on the K-START tape reader. XX equals tape revision number.

6.3.8.2 Start tape reader.

6.3.8.2.1 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +10XXX
b. R2 = +00063 (tape number)
c. R3 = -000XX (tape revision number)

6.3.8.2.2 Start tape reader.

6.3.8.2.3 When tape reader stops, wait 20 seconds.

6.3.8.3 E-Memory Program Load.

6.3.8.3.1 Start tape reader.

6.3.8.3.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00000.

6.3.8.4 Test Position Data Load (+X Scale Factor)

6.3.8.4.1 Start tape reader.

6.3.8.4.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.3.8.4.3 Start tape reader

6.3.8.4.4 When tape reader stops, VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nave Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.4.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.4.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001).

6.3.8.5 **Test Position Data Load (+Y Scale Factor)**

6.3.8.5.1 Start tape reader.

6.3.8.5.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.3.8.5.3 Start tape reader.

6.3.8.5.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.5.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.5.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.3.8.6 **Test Position Data Load (+Z Scale Factor).**

6.3.8.6.1 Start tape reader.

6.3.8.6.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.3.8.6.3 Start tape reader.

6.3.8.6.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.6.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.6.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.3.8.7 Test Position Data Load (-X Scale Factor)

6.3.8.7.1 Start tape reader.

6.3.8.7.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.3.8.7.3 Start tape reader.

6.3.8.7.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.7.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.7.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.3.8.8 Test Position Data Load (-Y Scale Factor)

6.3.8.8.1 Start tape reader.

6.3.8.8.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.3.8.8.3 Start tape reader.

6.3.8.8.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTER into K-148 and enter correct azimuth.

6.3.8.8.4 (continued) If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.8.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.8.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.3.8.9 Test Position Data Load (-Z Scale Factor)

6.3.8.9.1 Start tape reader.

6.3.8.9.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.3.8.9.3 Start tape reader.

6.3.8.9.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX. XX Nav Base Azimuth
R2 = XX. XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.9.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.9.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.3.8.10 Test Position Data Load (+X Scale Factor)

6.3.8.10.1 Start tape reader.

6.3.8.10.2 When tape reader stops verify that CRT DSKY Row 1 indicates +00001.

6.3.8.10.3 Start tape reader.

6.3.8.10.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX. XX Nav Base Azimuth
R2 = XX. XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.10.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.10.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.3.8.11 Test Position Data Load (+Y Scale Factor)

6.3.8.11.1 Start tape reader.

6.3.8.11.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.3.8.11.3 Start tape reader.

6.3.8.11.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX. XX Nav Base Azimuth
R2 = XX. XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.11.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.11.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.3.8.12 **Test Position Data Load (+Z Scale Factor)**

6.3.8.12.1 **Start tape reader.**

6.3.8.12.2 **When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.**

6.3.8.12.3 **Start tape reader.**

6.3.8.12.4 **When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:**

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.12.5 **On K-148 enter the following:**

VERB 33 ENTR

6.3.8.12.6 **In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)**

6.3.8.13 **Test Position Data Load (-X Scale Factor)**

6.3.8.13.1 **Start tape reader.**

6.3.8.13.2 **When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.**

6.3.8.13.3 **Start tape reader.**

6.3.8.13.4 **When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:**

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.13.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.13.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.3.8.14 Test Position Data Load (-Y Scale Factor)

6.3.8.14.1 Start tape reader.

6.3.8.14.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.3.8.14.3 Start tape reader.

6.3.8.14.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.14.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.14.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.3.8.15 Test Position Data Load (-Z Scale Factor)

6.3.8.15.1 Start tape reader.

6.3.8.15.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.3.8.15.3 Start tape reader.

6.3.8.15.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

6.3.8.15.4 (continued) If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.15.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.15.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.3.8.16 Test Position Data Load (+X Scale Factor)

6.3.8.16.1 Start tape reader.

6.3.8.16.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00001.

6.3.8.16.3 Start tape reader.

6.3.8.16.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.16.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.16.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.3.8.17 Test Position Data Load (+Y Scale Factor)

6.3.8.17.1 Start tape reader.

6.3.8.17.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.3.8.17.3 Start tape reader.

6.3.8.17.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.17.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.17.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.3.8.18 Test Position Data Load (+Z Scale Factor)

6.3.8.18.1 Start tape reader.

6.3.8.18.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.3.8.18.3 Start tape reader.

6.3.8.18.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.18.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.18.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.3.8.19 Test Position Data Load (-X Scale Factor)

6.3.8.19.1 Start tape reader.

6.3.8.19.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.3.8.19.3 Start tape reader.

6.3.8.19.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX. XX Nav Base Azimuth
R2 = XX. XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.19.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.19.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.3.8.20 Test Position Data Load (-Y Scale Factor)

6.3.8.20.1 Start tape reader.

6.3.8.20.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.3.8.20.3 Start tape reader.

6.3.8.20.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX. XX Nav Base Azimuth
R2 = XX. XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.20.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.20.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.3.8.21 Test Position Data Load (-Z Scale Factor)

6.3.8.21.1 Start tape reader.

6.3.8.21.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.3.8.21.3 Start tape reader.

6.3.8.21.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.21.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.21.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.3.8.22 Test Position Data Load (+X Scale Factor)

6.3.8.22.1 Start tape reader.

6.3.8.22.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00001.

6.3.8.22.3 Start tape reader.

6.3.8.22.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

6.3.8.22.4 (continued) If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.22.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.22.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+X IRIG scale factor error in parts per million. Position +00001.)

6.3.8.23 Test Position Data Load (+Y Scale Factor)

6.3.8.23.1 Start tape reader.

6.3.8.23.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00002.

6.3.8.23.3 Start tape reader.

6.3.8.23.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.23.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.23.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Y IRIG scale factor error in parts per million. Position +00002.)

6.3.8.24 Test Position Data Load (+Z Scale Factor)

6.3.6.24.1 Start tape reader.

6.3.8.24.2 When tape reader stops verify that CRT DSKY Row 1 display indicates +00003.

6.3.8.24.3 Start tape reader.

6.3.8.24.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.24.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.24.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (+Z IRIG scale factor error in parts per million. Position +00003.)

6.3.8.25. Test Position Data Load (-X Scale Factor)

6.3.8.25.1 Start tape reader.

6.3.8.25.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00001.

6.3.8.25.3 Start tape reader.

6.3.8.25.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX.XX Nav Base Azimuth
R2 = XX.XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.25.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.25.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-X IRIG scale factor error in parts per million. Position -00001.)

6.3.8.26 **Test Position Data Load (-Y Scale Factor)**

6.3.8.26.1 Start tape reader.

6.3.8.26.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00002.

6.3.8.26.3 Start tape reader.

6.3.8.26.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX. XX Nav Base Azimuth
R2 = XX. XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.26.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.26.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Y IRIG scale factor error in parts per million. Position -00002.)

6.3.8.27 **Test Position Data Load (-Z Scale Factor)**

6.3.8.27.1 Start tape reader.

6.3.8.27.2 When tape reader stops verify that CRT DSKY Row 1 display indicates -00003.

6.3.8.27.3 Start tape reader.

6.3.8.27.4 When tape reader stops VERB 06 NOUN 41 flashes. Verify the following on the CRT DSKY display:

R1 = XXX. XX Nav Base Azimuth
R2 = XX. XXX Site Latitude

If R1 requires correction, enter VERB 21 ENTR into K-148 and enter correct azimuth.

If R2 requires correction, enter VERB 22 ENTR into K-148 and enter correct latitude.

6.3.8.27.5 On K-148 enter the following:

VERB 33 ENTR

6.3.8.27.6 In approximately 90 seconds VERB 06 NOUN 98 will flash. Record from CRT DSKY display Row 1. (-Z IRIG scale factor error in parts per million. Position -00003.)

6.3.8.28 Terminate this test by entering the following into K-148:

VERB 36 ENTR Wait 10 seconds.
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.8.29 The four-run average Scale Factor Error for each of the six positions shall be 0 plus or minus 1750 ppm.

6.3.9 IMU Performance Test. A reference data sheet is provided at the end of this section to aid in data reduction.

6.3.9.1 Insure that IMU Operate power and LGC Operate power has been supplied for a minimum of one hour and that the IMU is not in a Gimbal Lock condition.

6.3.9.2 On CRT, monitor and record PIPA TEMP (CG 2300).

6.3.9.3 Verify K-START Tape F10L004-K00081-XX IMU Performance test is on the tape reader. XX equals tape revision number

6.3.9.4 Start tape reader.

6.3.9.4.1 When tape reader stops verify the following on the CRT DSKY:

a. R1 = +10XXX
b. R2 = +00081 (tape number)
c. R3 = -000XX (tape revision number)

6.3.9.4.2 Start tape reader.

6.3.9.4.3 When tape reader stops, wait 10 seconds.

6.3.9.5 Start the tape reader. After 15 seconds, verify IMU is coarse aligned to zero degrees.

6.3.9.6 E-Memory Program Load.

6.3.9.6.1 Start the tape reader. When tape reader stops, verify the following DSKY display:

Row 1
Row 3

6.3.9.7 Test Position +00001.

6.3.9.7.1 E-Memory Program and Test Position Matrix Sum Check

6.3.9.7.1.1 Start tape reader.

6.3.9.7.1.2 When tape reader stops, verify DSKY Row 1 displays +00001.

6.3.9.7.2 Start tape reader.

6.3.9.7.2.1 When tape reader stops wait 20 seconds.

6.3.9.7.3 Test Initialization.

6.3.9.7.3.1 Start tape reader.

6.3.9.7.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.7.4 Horizontal Drift Test

6.3.9.7.4.1 Start tape reader.

6.3.9.7.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.7.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.7.5 Test Termination.

6.3.9.7.5.1 Start tape reader.

6.3.9.7.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.8 Test Position +00002.

6.3.9.8.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.8.1.1 Start tape reader.

6.3.9.8.1.2 When tape reader stops, verify DSKY Row 1 displays +00002.

6.3.9.8.2 Start tape reader.

6.3.9.8.2.1 When tape reader stops, wait 20 seconds.

6.3.9.8.3 Test Initialization.

6.3.9.8.3.1 Start tape reader.

6.3.9.8.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.8.4 Horizontal Drift Test.

6.3.9.8.4.1 Start tape reader.

6.3.9.8.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.8.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.8.5 PIPA Scale Factor Test.

6.3.9.8.5.1 Start tape reader.

6.3.9.8.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.3.9.8.6 Vertical Drift Test.

6.3.9.8.6.1 Start tape reader.

6.3.9.8.6.2 In approximately 67 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.3.9.8.7 Test Termination.

6.3.9.8.7.1 Start tape reader.

6.3.9.8.7.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.9 Test Position +00003.

6.3.9.9.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.9.1.1 Start tape reader.

6.3.9.9.1.2 When tape reader stops, verify DSKY Row 1 displays +00003.

6.3.9.9.2 Start tape reader.

6.3.9.9.2.1 When tape reader stops, wait 20 seconds.

6.3.9.9.3 Test Initialization.

6.3.9.9.3.1 Start tape reader.

6.3.9.9.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.9.4 Horizontal Drift Test

6.3.9.9.4.1 Start tape reader.

6.3.9.9.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.9.4.3 In approximately 14 minutes, VERB 06 NOUN 96 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.9.5 Test Termination.

6.3.9.9.5.1 Start tape reader.

6.3.9.9.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.10 Test Position +00004.

6.3.9.10.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.10.1.1 Start tape reader.

6.3.9.10.1.2 When tape reader stops, verify DSKY Row 1 displays +00004.

6.3.9.10.2 Start tape reader.

6.3.9.10.2.1 When tape reader stops, wait 20 seconds.

6.3.9.10.3 Test Initialization.

6.3.9.10.3.1 Start tape reader.

6.3.9.10.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.10.4 Horizontal Drift Test.

6.3.9.10.4.1 Start tape reader.

6.3.9.10.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.10.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.3.9.10.5 PIPA Scale Factor Test.

6.3.9.10.5.1 Start tape reader.

6.3.9.10.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.3.9.10.6 Vertical Drift Test.

6.3.9.10.6.1 Start tape reader.

6.3.9.10.6.2 In approximately 67 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.3.9.10.7 Test Termination.

6.3.9.10.7.1 Start tape reader.

6.3.9.10.7.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.11 Test Position +00005.

6.3.9.11.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.11.1.1 Start tape reader.

6.3.9.11.1.2 When tape reader stops, verify DSKY Row 1 displays +00005.

6.3.9.11.2 Start tape reader.

6.3.9.11.2.1 When tape reader stops, wait 20 seconds.

6.3.9.11.3 Test Initialization.

6.3.9.11.3.1 Start tape reader.

6.3.9.11.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.11.4 PIPA Scale Factor Test

6.3.9.11.4.1 Start tape reader. Record time.

6.3.9.11.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM and GIMBAL LOCK lamps shall be lit.

6.3.9.11.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.3.9.11.5 Test Termination.

6.3.9.11.5.1 Start tape reader.

6.3.9.11.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.12 Test Position +00006.

6.3.9.12.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.12.1.1 Start tape reader.

6.3.9.12.1.2 When tape reader stops, verify DSKY Row 1 displays +00006.

6.3.9.12.2 Start tape reader.

6.3.9.12.2.1 When tape reader stops, wait 20 seconds.

6.3.9.12.3 Test Initialization.

6.3.9.12.3.1 Start tape reader.

6.3.9.12.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.12.4 PIPA Scale Factor Test.

6.3.9.12.4.1 Start tape reader. Record time.

6.3.9.12.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT, PROG ALARM and GIMBAL LOCK lamps shall be lit.

6.3.9.12.4.3 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record time. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec). GIMBAL LOCK lamp shall be out.

6.3.9.12.5 Test Termination.

6.3.9.12.5.1 Start tape reader.

6.3.9.12.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.13 Test Position +00007.

6.3.9.13.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.13.1.1 Start tape reader.

6.3.9.13.1.2 When tape reader stops verify DSKY Row 1 displays +00007.

6.3.9.13.2 Start tape reader.

6.3.9.13.2.1 When tape reader stops, wait 20 seconds.

6.3.9.13.3 Test Initialization.

6.3.9.13.3.1 Start tape reader.

6.3.9.13.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.13.4 Horizontal Drift Test.

6.3.9.13.4.1 Start tape reader.

6.3.9.13.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.13.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru/g).

6.3.9.13.5 Test Termination.

6.3.9.13.5.1 Start tape reader.

6.3.9.13.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.14 Test Position +00008.

6.3.9.14.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.14.1.1 Start tape reader.

6.3.9.14.1.2 When tape reader stops, verify DSKY Row 1 displays +00008.

6.3.9.14.2 Start tape reader.

6.3.9.14.2.1 When tape reader stops, wait 20 seconds.

6.3.9.14.3 Test Initialization.

6.3.9.14.3.1 Start tape reader.

6.3.9.14.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.14.4 Horizontal Drift Test

6.3.9.14.4.1 Start tape reader.

6.3.9.14.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish

6.3.9.14.4.3 In approximately 14 minutes, VERB 06 NOUN 96 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.14.5 Test Termination.

6.3.9.14.5.1 Start tape reader.

6.3.9.14.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.15 Test Position +00009.

6.3.9.15.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.15.1.1 Start tape reader.

6.3.9.15.1.2 When tape reader stops, verify DSKY Row 1 displays +00009.

6.3.9.15.2 Start tape reader.

6.3.9.15.2.1 When tape reader stops, wait 20 seconds.

6.3.9.15.3 Test Initialization.

6.3.9.15.3.1 Start tape reader.

6.3.9.15.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.15.4 Horizontal Drift Test.

6.3.9.15.4.1 Start tape reader.

6.3.9.15.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.15.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.15.5 Test Termination

6.3.9.15.5.1 Start tape reader.

6.3.9.15.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.16 Test Position +00010.

6.3.9.16.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.16.1.1 Start tape reader.

6.3.9.16.1.2 When tape reader stops, verify DSKY Row 1 displays +00010.

6.3.9.16.2 Start tape reader.

6.3.9.16.2.1 When tape reader stops, wait 20 seconds.

6.3.9.16.3 Test Initialization.

6.3.9.16.3.1 Start tape reader.

6.3.9.16.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.16.4 Horizontal Drift Test.

6.3.9.16.4.1 Start tape reader.

6.3.9.16.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.16.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.16.5 Test Termination.

6.3.9.16.5.1 Start tape reader.

6.3.9.16.5.2 When tape reader stops, wait 10 seconds before continuing:

6.3.9.17 Test Position +00011.

6.3.9.17.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.17.1.1 Start tape reader.

6.3.9.17.1.2 When tape reader stops, verify DSKY Row 1 displays +00011.

6.3.9.17.2 Start tape reader.

6.3.9.17.2.1 When tape reader stops, wait 20 seconds.

6.3.9.17.3 Test Initialization.

6.3.9.17.3.1 Start tape reader.

6.3.9.17.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.17.4 Horizontal Drift Test.

6.3.9.17.4.1 Start tape reader.

6.3.9.17.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.17.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.17.5 PIPA Scale Factor Test.

6.3.9.17.5.1 Start tape reader.

6.3.9.17.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXXX. and .XXXXX cm/sec/sec).

6.3.9.17.6 Test Termination.

6.3.9.17.6.1 Start tape reader.

6.3.9.17.6.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.18 Test Position +00012.

6.3.9.18.1 E-Memory Program and Test Position Matrix Sum Check

6.3.9.18.1.1 Start tape reader.

6.3.9.18.1.2 When tape reader stops, verify DSKY Row 1 displays +00012.

6.3.9.18.2 Start tape reader.

6.3.9.18.2.1 When tape reader stops, wait 20 seconds.

6.3.9.18.3 Test Initialization.

6.3.9.18.3.1 Start tape reader.

6.3.9.18.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

6.3.9.18.3.2 (continued) If the display is correct, proceed to next step; if it is not, perform the following on K-148:

VERB 24 ENTR
XXX.XX (Correct Nav Base Azimuth ±0.5 deg)
XX.XXX (Correct Site Latitude)

6.3.9.18.4 Horizontal Drift Test.

6.3.9.18.4.1 Start tape reader.

6.3.9.18.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.18.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.18.5 PIPA Scale Factor Test.

6.3.9.18.5.1 Start tape reader.

6.3.9.18.5.2 In approximately 5 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 1 and Row 2 display (XXXX. and .XXXXX cm/sec/sec).

6.3.9.18.6 Test Termination.

6.3.9.18.6.1 Start tape reader.

6.3.9.18.6.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.19 Test Position +00013.

6.3.9.19.1 E-Memory Program and Test Position Matrix Sum Check.

6.3.9.19.1.1 Start tape reader.

6.3.9.19.1.2 When tape reader stops, verify DSKY Row 1 displays +00013.

6.3.9.19.2 Start tape reader.

6.3.9.19.2.1 When tape reader stops, wait 20 seconds.

6.3.9.19.3 Test Initialization.

6.3.9.19.3.1 Start tape reader.

6.3.9.19.3.2 When VERB 06 NOUN 41 flashes, verify DSKY displays the following:

Major Mode	07
Row 1	XXX.XX (Nav Base Azimuth)
Row 2	XX.XXX (Site Latitude)

If the display is correct proceed to next step; if it is not, perform the following on K-148:

VERB 24	ENTR
XXX.XX	(Correct Nav Base Azimuth ±0.5 deg)
XX.XXX	(Correct Site Latitude)

6.3.9.19.4 Horizontal Drift Test.

6.3.9.19.4.1 Start tape reader.

6.3.9.19.4.2 When tape reader stops, verify DSKY blanks except for PROG indication of 07. The NO ATT lamp shall illuminate and then extinguish.

6.3.9.19.4.3 In approximately 14 minutes, VERB 06 NOUN 98 shall flash. Record DSKY Row 2 display (XXX.XX meru).

6.3.9.19.5 Test Termination.

6.3.9.19.5.1 Start tape reader.

6.3.9.19.5.2 When tape reader stops, wait 10 seconds before continuing.

6.3.9.20 On CRT, record IRIG TEMP (CG 2301) and PIPA TEMP (CG 2300).

6.3.9.21 On K-148, enter the following sequence:

VERB 41	NOUN 20	ENTR
+00000		ENTR
+00000		ENTR
+00000		ENTR

6.3.9.22 Calculations.

NOTE: Use Post Vibration or System Test data points only.

6.3.9.22.1 **Y PIPA Data Correction Calculation.**

6.3.9.22.1.1 From the uplink file tape, the compressed data tape or the PCM tape, request a data reduction of the X and Z accelerometer ΔV counts (addresses 37 and 41, respectively) and the TIME 2 and TIME 1 registers (addresses 24 and 25, respectively) for the period during which the Y PIPA test was being performed in Positions 5 and 6 of the IMU Performance Test.

6.3.9.22.1.2 Perform the following calculations for Position 5.

$G'_5 = (G_5/\text{Cos }\theta y_5)$

where:

G_5 = Measured acceleration term (line i)

G'_5 = Corrected acceleration term (corrected value for line i)

$\text{Cos }\theta y_5 = 1 - (\theta^2 y_5/2)$ for small angles

$\theta y_5 = \sqrt{\theta^2{}_{x5} + \theta^2{}_{z5}}$

and:

$\theta_{z5} = (\Delta V_{x5} - \Delta V_x \text{ Bias})(\text{S.F.}_x)/(\Delta T)(\text{local g})$

$\theta_{x5} = (\Delta V_{z5} - \Delta V_z \text{ Bias})(\text{S.F.}_z)/(\Delta T)(\text{local g})$

and:

$\Delta V_x \text{ Bias} = (\text{X PIPA Bias})(\Delta T)/\text{S.F.}_x$

$\Delta V_z \text{ Bias} = (\text{Z PIPA Bias})(\Delta T)/\text{S.F.}_z$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.3.9.22.1.3 Perform the following calculations for Position 6.

$G'_6 = (G_6/\cos\theta y_6)$

where:

G_6 = Measured acceleration term (line j)

G'_6 = Corrected acceleration term (corrected value for line j)

$\cos\theta y_6 = 1 - (\theta^2 y_6/2)$ for small angles

$\theta y_6 = \sqrt{\theta^2{}_{x6} + \theta^2{}_{z6}}$

and:

$\theta_{z6} = (\Delta V_{x6} - \Delta V_x \text{ Bias})(\text{S.F.}_x) / (\Delta T)(\text{local } g)$

$\theta_{x6} = (\Delta V_{z6} - \Delta V_z \text{ Bias})(\text{S.F.}_z) / (\Delta T)(\text{local } g)$

and:

ΔV_x Bias = (X PIPA Bias) $(\Delta T)/\text{S.F.}_x$

ΔV_z Bias = (Z PIPA Bias) $(\Delta T)/\text{S.F.}_z$

S.F. and Bias terms are obtained from Positions 1 through 4 of the IMU Performance Test.

6.3.9.22.2 Obtain data from last IRIG and/or PIPA Test and fill in Data Sheet x_{1-1}.

6.3.9.22.3 Obtain data from second last IRIG and/or PIPA Test and fill in Data Sheet x_{1-2}.

6.3.9.22.4 Obtain data from third last IRIG and/or PIPA Test and fill in Data Sheet x_{1-3}.

6.3.6.22.6 Perform the following calculations for each item appearing on Data Sheet x_i.

NOTE: See Paragraph 5.7 before continuing.

$$D_1 = \left| x_{i-1} - x_i \right|$$

$$D_2 = \left| x_{i-1} - x_i \right| + \left| x_{i-2} - x_{i-1} \right|$$

$$D_3 = \left| x_{i-3} - x_{i-2} \right| + \left| x_{i-2} - x_{i-1} \right| + \left| x_{i-1} - x_i \right|$$

DATA SHEET

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.3.9. 7.4.3	+N BDY - ADOAY Position +00001	meru/g	( )___·__	a
6.3.9. 8.4.3	+N BDZ - ADOAZ Position +00002	meru/g	( )___·__	b
6.3.9. 8.5.2	-X PIPA Test Position +00002	cm/sec^2	( ) 0 0___· ( )_____	c
6.3.9. 8.6.2	-N BDX + ADIAX Position +00002	meru/g	( )___·__	d
6.3.9. 9.4.3	+N BDX - ADOAX Position +00003	meru/g	( )___·__	e
6.3.9. 10.4.3	+N BDY + ADSRAY Position +00004	meru/g	( )___·__	f
6.3.9. 10.5.2	-Z PIPA Test Position +00004	cm/sec^2	( ) 0 0___· ( )_____	g
6.3.9. 10.6.2	+N BDZ + ADIAZ Position +00004	meru/g	( )___·__	h
6.3.9. 11.4.3	+Y PIPA Test Position +00005	cm/sec^2	( ) 0 0___· ( )_____	i

DATA SHEET (continued)

ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	
6.3.9.12.4.3	-Y PIPA Test Position +00006	cm/sec^2	( ) 0 0 ___. ( ) _____	j
6.3.9.13.4.3	-NBDX + .707 (ADSRAX - ADOAX) Position +00007	meru/g	( ) ___.__	k
6.3.9.14.4.3	-.707 (NBDZ+NBDY) +0.5 (ADIAZ-ADIAY) +0.5 (ADSRAY + ADSRAZ) Position +00008	meru/g	( ) ___.__	l
6.3.9.15.4.3	-NBDZ + .707 (ADSRAZ-ADOAZ) Position +00009	meru/g	( ) ___.__	m
6.3.9.16.4.3	.707 (NBDY-NBDX) +0.5 (ADIAY-ADIAX) +0.5 (ADSRAX) + 0.5 (ADOAY) Position +00010	meru/g	( ) ___.__	n
6.3.9.17.4.3	-NDBX - ADOAX Position +00011	meru/g	( ) ___.__	o
6.3.9.17.5.2	+Z PIPA Test Position +00011	cm/sec^2	( ) 0 0 ___. ( ) _____	p
6.3.9.18.4.3	+NBDY + ADOAY Position +00012	meru/g	( ) ___.__	q
6.3.9.18.5.2	+X PIPA Test Position +00012	cm/sec^2	( ) 0 0 ___. ( ) _____	r
6.3.9.19.4.3	+NBDZ + ADOAZ Position +00013	meru/g	( ) ___.__	s

DATA SHEET

CALCULATION	PARAMETER	UNITS	
$\frac{\text{line a + line q}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDY - ADOAY + NBDY + ADOAY}}{2}$ Transfer result to line ao	NBDY	meru	t
$\frac{\text{line q - line a}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDY + ADOAY - (NBDY - ADOAY)}}{2}$	ADOAY	meru/g	u
$\frac{\text{line b + line s}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDZ - ADOAZ + NBDZ + ADOAZ}}{2}$ Transfer result to line ap	NBDZ	meru	v
$\frac{\text{line s - line b}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDZ + ADOAZ - (NBDZ - ADOAZ)}}{2}$	ADOAZ	meru/g	w
$\frac{\text{line e - line o}}{2} = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDX - ADOAX - (-NBDX - ADOAX)}}{2}$ Transfer result to line aq	NBDX	meru	x
$\frac{\text{line e + line o}}{2} \text{ x } (-1) = (\quad)\_\_\_.\_\_$ $\frac{\text{NBDX - ADOAX - NBDX - ADOAX}}{2} \text{ x } (-1)$	ADOAX	meru/g	y

DATA SHEET (continued)

CALCULATION	PARAMETER	UNITS	
line d + line x = ( ) ___ . __ (-NBDX + ADIAX) + NBDX Transfer result to line au	ADIAX	meru/g	z
line f - line t = ( ) ___ . __ (+NBDY + ADSRAY) - NBDY Transfer result to line ar	ADSRAY	meru/g	aa
line h - line v = ( ) ___ . __ (+NBDZ + ADIAZ) - NBDZ Transfer result to line av	ADIAZ	meru/g	ab
[line k + line x + .707 line y] x 1.414 [-NBDX + .707 ADSRAX - .707 ADOAX + NBDX + .707 ADOAX] x 1.414 Transfer results to line at	ADSRAX	meru/g	ac
(line m + line v + line w) x 1.414 [-NBDZ + .707(ADSRAZ-ADOAZ) + NBDZ + .707 ADOAZ] x 1.414 Transfer results to line as	ADSRAZ	meru/g	ad
(line n - .707 line t + .707 line x + 0.5 line z - 0.5 line ac - 0.5 line u) x 2 [.707(NBDY-NBDX) + 0.5(ADIAY-ADIAX) +0.5 ADSRAX + 0.5 ADOAY -.707 NBDY + .707 NBDX + 0.5 ADIAX -0.5 ADSRAX - 0.5 ADOAY] x 2 Transfer results to line aw.	ADIAY	meru/g	ae
line r - line c = ( )	PIPA X2G	cm/sec^2	af
line i - line j = ( )	PIPA Y2G	cm/sec^2	ag
line p - line g = ( )	PIPA Z2G	cm/sec^2	ah

DATA SHEET (continued)

CALCULATION	PARAMETER	UNITS	
1958.48 — line af x 1 cm/sec pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ax.	X PIPA S. F.	cm/sec/ pulse	ai
1958.48 — line ag x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer results to line ay.	Y PIPA S. F.	cm/sec/ pulse	aj
1958.48 — line ah x 1 cm/sec/pulse = Subtract 1.000000 from this value, multiply x 10^6 and transfer to line az.	Z PIPA S. F.	cm/sec pulse	ak
1/2 (line r + line c) = ( )__ . ___ Transfer results to line ba.	X PIPA Bias	cm/sec^2	al
1/2 (line i + line j) = ( )__ . ___ Transfer results to line bb.	Y PIPA Bias	cm/sec^2	am
1/2 (line p + line g) = ( )__ . ___ Transfer results to line bc.	Z PIPA Bias	cm/sec^2	an

DATA SHEET (x_1)

PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC	
NBDY	meru	-15		+15			ao
NBDZ	meru	-15		+15			ap
NBDX	meru	-15		+15			aq
ADSRAY	meru/g	-40		+40			ar
ADSRAZ	meru/g	-40		+40			as
ADSRAX	meru/g	-40		+40			at
ADIAX	meru/g	-100		+100			au
ADIAZ	meru/g	-100		+100			av
ADIAY	meru/g	-100		+100			aw
X PIPA S.F. error from line ai	PPM	-1900		+1900			ax
Y PIPA S.F. error from line aj	PPM	-1900		+1900			ay
Z PIPA S.F. error from line ak	PPM	-1900		+1900			az
X PIPA Bias from line al	cm/sec^2	-3.1		+3.1			ba
Y PIPA Bias from line am	cm/sec^2	-3.1		+3.1			bb
Z PIPA Bias from line an	cm/sec^2	-3.1		+3.1			bc

DATA SHEET (x_{1-1})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET (x_1-2)

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S.F. error	PPM	
Y PIPA S.F. error	PPM	
Z PIPA S.F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET (x_{1-3})

PARAMETER	UNITS	RECORDED VALUE
NBDY	meru	
NBDZ	meru	
NBDX	meru	
ADSRAY	meru/g	
ADSRAZ	meru/g	
ADSRAX	meru/g	
ADIAX	meru/g	
ADIAZ	meru/g	
ADIAY	meru/g	
X PIPA S. F. error	PPM	
Y PIPA S. F. error	PPM	
Z PIPA S. F. error	PPM	
X PIPA Bias	cm/sec^2	
Y PIPA Bias	cm/sec^2	
Z PIPA Bias	cm/sec^2	

DATA SHEET

PARAMETER	UNITS	D_1	MAX	D_2	MAX	D_3	MAX
NBDY	meru		6		9		11
NBDZ	meru		6		9		11
NBDX	meru		6		9		11
ADSRAY	meru/g		14		21		25
ADSRAZ	meru/g		14		21		25
ADSRAX	meru/g		14		21		25
ADIAX	meru/g		17		33		40
ADIAZ	meru/g		17		33		40
ADIAY	meru/g		17		33		40
X PIPA S.F. error	PPM		400		500		600
Y PIPA S.F. error	PPM		400		500		600
Z PIPA S.F. error	PPM		400		500		600
X PIPA Bias	cm/sec^2		0.5		0.7		0.9
Y PIPA Bias	cm/sec^2		0.5		0.7		0.9
Z PIPA Bias	cm/sec^2		0.5		0.7		0.9

6.3.10 **LGC Voltage Margin Test**

6.3.10.1 Initial Conditions.

6.3.10.1.1 Insure that the G&N System is in the Standby Mode.

6.3.10.1.2 On the CRT, verify the +28 VDC LGC OPERATE bus is between 24.5 and 33.5 vdc (GG 1520).

6.3.10.1.3 On Panel 5, set lighting override ANUN SW to OFF. Rotate the ANUN/NUM dimmer fully CCW.

6.3.10.2 Voltage Margin Determination

6.3.10.2.1 On the PSA Adapter Module (PSAAM) (410-31080), place INHIBIT VOLTAGE FAIL switch to ON.

CAUTION: The +4 vdc LGC supply voltage shall never be operated lower than +2.5 vdc or higher than +5.2 vdc (GG 1030.)

The +14 vdc LGC supply shall never be operated less than +8.5 vdc or higher than +17.0 vdc (GG 1020). LTG-ANUN/NUM control on Panel 5 shall be set to DIM during the performance of the Voltage Margin Test in order to avoid decreasing the operating life of the DSKY EL lamps.

NOTE: The flashing indication of the LGC supplies may be disregarded for this test.

6.3.10.2.2 Enter 0001 into R-155. Verify and execute. Enter 1100 into R-153. Verify and execute.

6.3.10.2.3 Enter 1111 into R-154. Verify and execute.

6.3.10.2.4 Enter in C-156±XX.X001114. (Enter a value for XX.X which will adjust the +14V power supply (GG 1020) as monitored on the CRT to 12.1 (+0.1, -0) vdc). Execute.

6.3.10.2.5 Enter in C-156±XX.X001124 (Enter a value for XX.X which will adjust the +4V power supply (GG 1030) as monitored on the CRT, to 3.4(+0.03, -0.00) vdc). Execute.

6.3.10.2.6 On K-148, enter the following:

VERB 36 ENTR Wait 10 seconds.

6.3.10.2.7 Verify K-START tape F16L004-K10538-XX LM Self-Check Test is on the K-START tape reader, where XX equals tape revision number.

6.3.10.2.7.1 Start tape reader.

6.3.10.2.7.2 When tape reader stops, verify:

R1 = +16XXX
R2 = +10538 (tape number)
R3 = -000XX (tape revision number)

6.3.10.2.8 Load E-Memory Program.

6.3.10.2.8.1 Start tape reader.

6.3.10.2.8.2 When tape reader stops, verify:

R1 = 00101.

6.3.10.2.9 Initiate Self-Check.

6.3.10.2.9.1 Start tape reader.

6.3.10.2.9.2 Wait until R2 = 00002. Verify RESTART lamp on DSKY is not lit.

6.3.10.2.10 Into R-154, insert 0011. Verify and execute.

6.3.10.2.11 In the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lit.

6.3.10.2.12 On the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to ON. Into R-154, insert 1111. Verify and execute. Press ERROR RESET.

6.3.10.2.13 Enter in C-156 (±) XX.X001114 (Enter a value for XX.X which will adjust the +14V power supply (GG 1020) as monitored on the CRT, to 16.4 (+0.1, -0.0) vdc). Execute.

6.3.10.2.14 Initiate Self-Check.

6.3.10.2.14.1 Return K-START tape to its previous stop.

6.3.10.2.14.2 Start tape reader.

6.3.10.2.14.3 Wait until R2 = 00002. Verify RESTART lamp on DSKY is not lit.

6.3.10.2.15 Into R-154, insert 1100. Verify and execute.

6.3.10.2.16 On the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lit. Set the INHIBIT VOLTAGE FAIL switch to ON. Into R-154, insert 1111. Verify and execute. Press ERROR RESET.

6.3.10.2.17 Enter in C-156±XX.X001124 (Enter a value for XX.X which will adjust the +4V power supply (GG 1030) as monitored on the CRT, to 4.6 (+0.08, -0.0) vdc). Execute.

6.3.10.2.18 Initiate Self-Check.

6.3.10.2.18.1 Return K-START tape to its previous stop.

6.3.10.2.18.2 Start tape reader.

6.3.10.2.18.3 Wait until R2 = 00002. Verify RESTART lamp on DSKY is not lit.

6.3.10.2.19 Into R-154, insert 0011. Verify and execute.

6.3.10.2.20 On the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lit. Set the INHIBIT VOLTAGE FAIL switch to ON. Into R-154, insert 1111. Verify and execute. Press ERROR RESET.

6.3.10.2.21 Enter in C-156 (±) XX.X001114 (Enter a value for XX.X which will adjust the 14V power supply (GG 1020) as monitored on the CRT, to 12.1 (+0.1, -0) vdc). Execute.

6.3.10.2.22 Initiate Self-Check.

6.3.10.2.22.1 Return K-START tape to its previous stop.

6.3.10.2.22.2 Start tape reader.

6.3.10.2.22.3 Wait until R2 = 00002. Verify RESTART lamp on the DSKY is not lit.

6.3.10.2.23 Into R-154, insert 1100. Verify and execute.

6.3.10.2.24 On the PSA Adapter Module, place INHIBIT VOLTAGE FAIL switch to OFF. Verify RESTART lamp on the DSKY is lit.

6.3.10.2.25 On R-154, enter 0000. Execute.

6.3.10.2.26 On R-155, enter 0000. Execute.

6.3.10.2.27 On K-148, press ERROR RESET.

6.3.10.2.28 Remove tape from K-START tape reader.

6.3.11 LGC Clock Frequency Test

6.3.11.1 Insure that LGC Operate power has been applied for a minimum of 10 minutes.

6.3.11.2 Verify that the counter is connected to the 3.2 kc signal on the hardline.

6.3.11.3 Obtain a 30 second sample of clock frequency.

6.3.11.4 Repeat 6.3.11.3 nine times.

6.3.11.5 The average of the 10 previous readings shall be 30.000000±0.000060 seconds.

6.3.11.6 Insure that the System is not in IMU Operate.

6.3.11.7 Enter the following on K-148:

VERB 37 ENTR
06 ENTR
VERB 50 NOUN 25 shall flash
Row 1 = 00062

Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the STBY lamp is lit.

6.3.11.8 Repeat steps 6.3.11.3 and 6.3.11.4.

6.3.11.9 Press and hold the PRO pushbutton on the DSKY for 3 seconds. Verify the STBY lamp is not lit. Restart lamp may be on. VERB 37 shall flash on the DSKY. Enter VERB 36 ENTR on DSKY. Wait 10 seconds.

6.3.11.10 MARK X Pushbutton Test.

6.3.11.10.1 On the Computer Control and Reticle Dimmer assembly, press and hold MARK X pushbutton.

6.3.11.10.2 On K-148 enter the following:

VERB 05 NOUN 09 ENTR

On the DSKY observe:

Row 1 = 00112
PROG alarm lamp is lit

Press ERR RSET.

6.3.11.10.3 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.10.4 Observe that DSKY Row 1 displays 00004.

6.3.11.10.5 Release MARK X pushbutton.

6.3.11.10.6 Observe that DSKY Row 1 displays 00000.

6.3.11.11 MARK Y Pushbutton Test

6.3.11.11.1 Press and hold the MARK Y Pushbutton on the Computer Control and Reticle Dimmer Assembly.

6.3.11.11.2 On K-148 enter the following:

VERB 05 NOUN 09 ENTR

On the DSKY observe:

Row 1 = 00112
PROG alarm lamp is lit

Press ERR RSET.

6.3.11.11.3 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.11.4 Observe that DSKY Row 1 displays 00010.

6.3.11.11.5 Release the MARK Y pushbutton.

6.3.11.11.6 Observe that DSKY Row 1 displays 00000.

6.3.11.12 REJECT Pushbutton Test

6.3.11.12.1 Press and hold the REJECT pushbutton on the Computer Control and Reticle Dimmer assembly.

[illegible] On K-148, enter the following:

VERB 05 NOUN 09 ENTR

6.3.11.12.2 On CRT verify FAILREG = 00112

PROG alarm lamp is lit

Press ERR RSET.

6.3.11.12.3 Enter the following on K-148:

VERB 11 NOUN 10 ENTR
00016 ENTR

6.3.11.12.4 Observe that DSKY Row 1 displays 00020.

6.3.11.12.5 Release the REJECT pushbutton.

6.3.11.12.6 Observe that DSKY Row 1 displays 00000.

6.3.11.13 Reticle Brightness Control Test

6.3.11.13.1 On the DSKY perform the following operation:

VERB 36 ENTR

6.3.11.13.2 On panel 11 close PGNS AOT lamp circuit breaker. On the Computer Control and Reticle Dimmer assembly, rotate the RETICLE BRIGHTNESS control to its minimum light intensity position. View through the AOT and verify that the Reticle lamp is off.

6.3.11.13.3 While viewing through the AOT, slowly rotate the RETICLE BRIGHTNESS control to increase the reticle brightness until a stop is reached. Observe that the reticle brightness has increased in intensity. Return RETICLE BRIGHTNESS control to off state. On panel 11 open PGNS AOT lamp circuit breaker.

6.3.11.14 AOT Eyepiece Heater Test.

6.3.11.14.1 Secure milliammeter HP 428B and current probe HP 428A-21A.

6.3.11.14.2 Locate P1 at Computer Control and Reticle Dimmer assembly. Push lacing cord away from P1 back to fifth tie point.

6.3.11.14.3 Clip current probe HP 428A-21A to blue wire in cable with red arrow pointing away from P1. Measure and record current indication. The current shall be between 139 and 244 ma.

6.3.11.14.4 Remove current probe, push lacing cord back to P1 and spot tie.

6.3.12 **Gimbal Friction Test**

6.3.12.1 Inner Gimbal Friction Test.

6.3.12.1.1 On K-148 enter the following sequence:

```
VERB 41 NOUN 20 ENTR
+00000          ENTR
+00000          ENTR
+00000          ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000          ENTR
+17000          ENTR
+17000          ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000          ENTR
+27000          ENTR
+27000          ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000          ENTR
+00000          ENTR
+00000          ENTR
```

6.3.12.1.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00150).

6.3.12.1.3 Set up Analog Recorder to monitor the following signals.

Meas. No.	Signal Name
a. GG 2110	IG Torque Motor Current
b. GG 2106	IG Servo Error Total
c. GG 2107	IG Servo Error in Phase
d. GG 2112	IG 1X Resolver Sine
e. GG 2113	IG 1X Resolver Cosine
f. GG 2220	IG CDU Fine Error
g. GG 1201	IMU 28V 1φ 800 CPS
h. GG 2221	IG CDU Coarse Error

6.3.12.1.4 Set up Analog Recorder to monitor the following signals:

Meas. No.	Signal Name
a. GG 2300	PIPA TEMP
[illegible]	[illegible]
c. GG 1820	+28 VDC LGC OPR BUS

6.3.12.1.5 After 10 seconds has elapsed since Step 6.3.12.1.1, enter the following into K-148:

```
VERB 21 NOUN 01 ENTR
02737           ENTR (OGC)
00000           ENTR
```

6.3.12.1.6 Verify on CRT, DSKY display

```
VERB 21 NOUN 01
R1 = 00000
R3 = 02737
```

6.3.12.1.7 On K-148 enter the following sequence:

```
NOUN 15         ENTR
00000           ENTR ENTR
37777           ENTR ENTR
37743           ENTR ENTR
00000           ENTR ENTR
00000           ENTR (once)
```

6.3.12.1.8 IG -360° TORQUE

6.3.12.1.9 On K-148 enter the following sequence:

```
VERB 42         ENTR
VERB 33         ENTR
```

6.3.12.1.10 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.1.11 On K-148 enter the following sequence:

```
VERB 40 NOUN 20 ENTER  Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000          ENTR
+00000          ENTR
+00000          ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000          ENTR
+17000          ENTR
+17000          ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000          ENTR
+27000          ENTR
```

6.3.12.1.11 (Continued)

+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.1.12 On the CRT, verify CDU X, CDU Y, CDU Z all indicate +00000 (±00150).

6.3.12.1.13 After 10 seconds has elapsed since Step 6.3.12.1.11, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.1.14 Verify on CRT, DSKY display.

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.1.15 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
40000 ENTR ENTR
40034 ENTR ENTR
00000 ENTR ENTR
00000 ENTR (once)
40034 ENTR ENTR
Verify R1 = 40034
00000 ENTR ENTR
Verify R1 = 00000
00000 ENTR (once)
Verify R1 = 00000

6.3.12.1.16 IG +360° TORQUE

6.3.12.1.17 On K-148 enter the following sequence

VERB 42 ENTR
VERB 33 ENTR

6.3.12.1.18 Monitor analog recorder. When the IG Torque Motor Current signal (GG 2110) drops to a quiescent level (approximately 12 minutes), stop the recorders.

6.3.12.2 Outer Gimbal Friction Test

6.3.12.2.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.12.2.2 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00150).

6.3.12.2.3 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2167	OG Servo Error In Phase
b. GG 2170	OG Torque Motor Current
c. GG 2166	OG Servo Error Total
d. GG 2280	OG CDU Fine Error
e. GG 2172	OG 1X Resolver Sine
f. GG 2173	OG 1X Resolver Cosine
g. GG 2281	OG CDU Coarse Error

6.3.12.2.4 After 10 seconds has elapsed since Step 6.3.12.2.1, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
37777 ENTR

6.3.12.2.5 Verify on CRT, DSKY display

VERB 21 NOUN 01
R1 = 37777
R3 = 02737

6.3.12.2.6 On K-148, enter the following sequence:

NOUN 15	ENTR
37743	ENTR ENTR
00000	ENTR ENTR
00000	ENTR ENTR
00000	ENTR ENTR
00000	ENTR (once)

6.3.12.2.7 OG -360° TORQUE

6.3.12.2.8 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.2.9 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.2.10 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTER, Wait 10 seconds

VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR
Wait 15 seconds	
VERB 41 NOUN 20	ENTR
+17000	ENTR
+17000	ENTR
+17000	ENTR
Wait 15 seconds	
VERB 41 NOUN 20	ENTR
+27000	ENTR
+27000	ENTR
+27000	ENTR
Wait 15 seconds	
VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR

6.3.12.2.11 On the CRT, verify CDU X, CDU Y, CDU Z indicate +00000 (±00150).

6.3.12.2.12 After 10 seconds has elapsed since Step 6.3.12.2.10, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
40000 ENTR

6.3.12.2.13 Verify on CRT, DSKY display:

VERB 21 NOUN 01
R1 = 40000
R3 = 02737

6.3.12.2.14 On K-148 enter the following sequence:

NOUN 15 ENTR
40034 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR

6.3.12.2.15 OG +360° TORQUE

6.3.12.2.16 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.2.17 Monitor analog recorder. When the OG Torque Motor Current signal (GG 2170) drops to a quiescent level (approximately 12 minutes) stop the recorders.

6.3.12.3 Middle Gimbal Friction Test.

6.3.12.3.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds

6.3.12.3.1 (Continued)

VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+06750 ENTR

6.3.12.3.2 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00150, and CDU Z = +06750±00200.

6.3.12.3.3 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2136	MG Servo Error Total
b. GG 2137	MG Servo Error In Phase
c. GG 2140	MG Torque Motor Current
d. GG 2143	MG 1X Resolver Cosine
e. GG 2250	MG CDU Fine Error
f. GG 2142	MG 1X Resolver Sine
g. GG 2251	MG CDU Coarse Error

6.3.12.3.4 After 10 seconds have elapsed since Step 6.3.12.3.1, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.3.5 Verify on CRT, DSKY display:

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.3.6 On K-148 enter the following sequence:

NOUN 15 ENTR
00000 ENTR ENTR
00000 ENTR ENTR
00000 ENTR ENTR
14000 ENTR ENTR
00000 ENTR (once)

6.3.12.3.7 MG -135° TORQUE

6.3.12.3.8 On K-148 enter the following sequence:

VERB 42 ENTR
VERB 33 ENTR

6.3.12.3.9 Monitor analog recorder. When MG Torque Motor Current (GG 2140) drops to a quiescent level (approximately 6 minutes), stop the recorders.

6.3.12.3.10 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+17000 ENTR
+17000 ENTR
+17000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+27000 ENTR
+27000 ENTR
+27000 ENTR
Wait 15 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
-06750 ENTR

6.3.12.3.11 On the CRT, verify CDU X = +00000±00200, CDU Y = +00000±00150, and CDU Z = -06750±00200.

6.3.12.3.12 After 10 seconds has elapsed since Step 6.3.12.3.10, enter the following sequence into K-148:

VERB 21 NOUN 01 ENTR
02737 ENTR
00000 ENTR

6.3.12.3.13 On the CRT, verify DSKY display:

VERB 21 NOUN 01
R1 = 00000
R3 = 02737

6.3.12.3.14 On K-148 enter the following sequence:

NOUN 15	ENTR
00000	ENTR ENTR
00000	ENTR ENTR
00000	ENTR ENTR
63777	ENTR ENTR
77777	ENTR (once)

6.3.12.3.15 MG +135° TORQUE

6.3.12.3.16 On K-148 enter the following sequence:

VERB 42	ENTR
VERB 33	ENTR

6.3.12.3.17 Monitor analog recorder. When the MG Torque Motor Current signal (GG 2140) drops to a quiescent level (approximately 6 minutes) stop the recorders.

6.3.12.3.18 On K-148 enter the following sequence:

VERB 41 NOUN 20	ENTR
+00000	ENTR
+00000	ENTR
+00000	ENTR
Wait 15 seconds	
VERB 36	ENTR

6.3.12.4 Test Analysis.

6.3.12.4.1 Remove the strip charts from analog recorders.

6.3.12.4.2 Examine each trace carefully to detect any sharp discontinuities of the traces. Disregard all transients less than 0.5 second on any Torque Motor Current signal.

6.3.12.4.3 Each Torque Motor Current signal on (GG 2140, GG 2170, GG 2110) shall not exceed 0.125 amp.

6.3.12.4.4 Each CDU Fine Error (GG 2220, GG 2280, GG 2250) shall not exceed 0.070 volts steady state. Disregard transients.

6.3.12.4.5 Each CDU Coarse Error (GG 2221, GG 2281, GG 2251) shall not exceed 0.680 volts.

6.3.13 Stabilization Loop Step Response Test

6.3.13.1 IG Response Test

6.3.13.1.1 On K-148 enter the following sequence:

VERB 40 NOUN 20 ENTR, Wait 10 seconds
VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR

6.3.13.1.2 On CRT, verify IG MG, and OG gimbal angles are between 358 and 002.

6.3.13.1.3 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2106	IG Servo Error Total
b. GG 2107	IG Servo Error In Phase
c. GG 2110	IG Torque Motor Current
d. GG 2112	IG 1X Resolver Sine
e. GG 2113	IG 1X Resolver Cosine
f. GG 2220	IG CDU Fine Error
g. GG 1201	IMU 28V 1 PCT 800 CPS

6.3.13.1.4 On K-148 enter the following:

VERB 40 NOUN 20 ENTR, Wait 10 seconds

6.3.13.1.5 On the CRT verify CDU X, CDU Y AND CDU Z indicate +00000±00200.

CAUTION: If the transients caused by the subsequent step input do not settle within 15 seconds, remove IMU Operate Power.

6.3.13.1.6 Enter 1000 into R-155.

6.3.13.1.7 Press XEQ/SEAL pushbutton on R-155 to enter the DC step voltage into the IG stabilization loop.

6.3.13.1.8 Prepare to start analog recorder.

6.3.13.1.9 Enter 0000 into R-155. Start analog recorder. Press the XEQ/SEAL pushbutton to remove the step input to the IG stabilization loop.

6.3.13.1.10 After the transient on the recorder has settled, stop this recorder.

6.3.13.1.11 From the Servo Error In Phase signal recorder trace measure the time interval (T1, Fig. 2) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 2). The period T1, shall not exceed 0.1 second and the trace shall have no more than 3 overshoots.

6.3.13.2 MG Response Test

6.3.13.2.1 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2136	MG Servo Error Total
b. GG 2137	MG Servo Error In Phase
c. GG 2140	MG Torque Motor Current
d. GG 2142	MG 1X Resolver Sine
e. GG 2143	MG 1X Resolver Cosine
f. GG 2250	MG CDU Fine Error
g. GG 1201	IMU 28V 1% 800 cps

6.3.13.2.2 On the CRT, verify CDU X, CDU Y and CDU Z indicate +00000 (±00200).

CAUTION: If the transients caused by the subsequent step input do not settle within 15 seconds, remove IMU Operate Power.

6.3.13.2.3 Enter 0100 into R-155. Press XEQ/SEAL pushbutton R-155 to enter the DC step voltage into the MG stabilization loop.

6.3.13.2.4 Prepare to start analog recorder.

6.3.13.2.5 Enter 0000 into R-155. Start analog recorder. Press XEQ/SEAL pushbutton to remove the step input to the MG stabilization loop.

6.3.13.2.6 After the transient on the recorder has settled, stop the recorder.

6.3.13.2.7 From the Servo Error In Phase signal recorder trace measure the time interval (T1 Fig. 2) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 2). The period T1, shall not exceed 0.1 seconds and the trace shall have no more than 3 overshoots.

6.3.13.3 OG Response Test

6.3.13.3.1 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 2166	OG Servo Error Total
b. GG 2167	OG Servo Error In Phase
c. GG 2170	OG Torque Motor Current

6.3.13.3.1 (Continued)

	Meas. No.	Signal Name
d.	GG 2172	OG 1X Resolver Sine
e.	GG 2173	OG 1X Resolver Cosine
f.	GG 2280	OG CDU Fine Error
g.	GG 1201	IMU 28V 1% 800 cps

6.3.13.3.2 On the CRT, verify CDU X, CDU Y and CDU Z indicate +00000 (±00200).

CAUTION: If the transients caused by the subsequent step input do not settle within 15 seconds, remove IMU Operate Power.

6.3.13.3.3 Enter 0010 into R-155. Press XEQ/SEAL pushbutton on R-155 to enter the DC step voltage into the OG stabilization loop.

6.3.13.3.4 Prepare to start analog recorder.

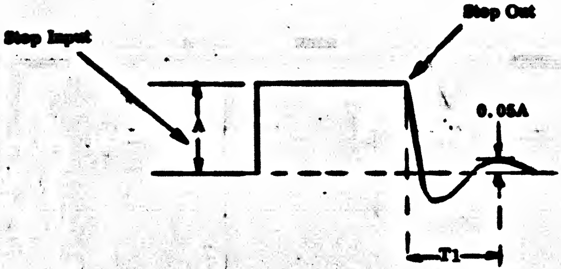
6.3.13.3.5 Enter 0000 into R-155. Start analog recorder. Press XEQ/SEAL pushbutton to remove the step input to the OG stabilization loop.

6.3.13.3.6 After the transient on the recorder has settled, stop the recorder.

6.3.13.3.7 From the Servo Error In Phase signal recorder trace, measure the time interval (T1, Fig. 2) between the removal of the step input to the point at which the trace settles to within 5 percent of the step magnitude (A, Fig. 2). The period, T1, shall not exceed 0.1 second and the trace shall have not more than 5 overshoots.

6.3.13.3.8 On K-148 enter the following sequence:

VERB 41 NOUN 20 ENTR
+00000 ENTR
+00000 ENTR
+00000 ENTR



TYPICAL STAB LOOP RESPONSE TO STEP INPUT

FIGURE 2

6.3.14 G&N Fine Alignment Test (see Table III in section 5).

6.3.15 AOT Functional Accuracy Test

NOTE: Use of a Dioptometer is required when sighting through AOT. The included angles between target LOS shall be known to ±10 arc-seconds. The elevation of each target LOS shall be known to ±15 arc-seconds.

6.3.15.1 Place the AOT in F detent position.

6.3.15.2 While viewing through the AOT instruct target F operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target F until the center of the target reticle appears in the center of the AOT reticle.

6.3.15.3 Level the Theodolite base while assuring that the center of the target reticle remains in the center of the AOT reticle.

6.3.15.4 When it has been assured that the Theodolite is level and the target reticle appears in the center of the AOT reticle, zero the F Theodolite azimuth dial.

6.3.15.5 Place the AOT in the L detent position.

6.3.15.6 While viewing through AOT instruct the target L operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target L until the target reticle appears in the lower right quadrant of the AOT field of view.

6.3.15.7 Level the Theodolite base while assuring that the target reticle remains visible in the lower right quadrant of the AOT field of view.

6.3.15.8 When it has been assured that the Theodolite is level and the target reticle is visible, zero the L Theodolite azimuth dial.

6.3.15.9 Place the AOT in the R detent position.

6.3.15.10 While viewing through the AOT instruct the R operator to translate (vertically and laterally) and rotate (in azimuth and elevation) target R until the target reticle appears in the lower left quadrant of the AOT field of view.

6.3.15.11 Level the Theodolite base while assuring that the target reticle remains visible in the lower left quadrant of the AOT field of view.

6.3.15.12 When it has been assured that the Theodolite is level and the target reticle is visible, zero the R Theodolite azimuth dial.

6.3.15.13 Verify that target Theodolite L, F and R bases are level. Place the AOT in each detent position from left to right and verify that each target reticle is still visible and in the proper field of view. If adjustments are required insure that the azimuth dial is rezeroed. Repeat this target scanning process until the AOT operator is satisfied with target placement.

6.3.15.14 AOT Measurement of X_1 (L-F)

6.3.15.15 Set AOT in L detent position.

6.3.15.16 Rotate the AOT control knob until the center of the target reticle is superimposed between the double Y reticle. Read and record as LY = XXX.XX.

6.3.15.17 Rotate the AOT control knob until the center of the target reticle is superimposed between the double SPIRAL lines of AOT reticle. Record AOT dial indication as LS = XXX.XX.

6.3.15.18 Record target L Theodolite elevation angle from horizontal as $\phi 1$.

6.3.15.19 Set AOT in F detent position.

6.3.15.20 Rotate AOT control knob until the center of the target reticle is superimposed between the double Y reticle. Record AOT dial indication as FY = XXX.XX.

6.3.15.21 Rotate the AOT control knob until the center of the target reticle is superimposed between the double S reticle lines. Record AOT dial indication as FS = XXX.XX.

6.3.15.22 Record target F Theodolite elevation angle from horizontal as ϕ_2.

6.3.15.23 AOT Measurement of X_2 (L - R).

6.3.15.24 Set AOT in R detent position.

6.3.15.25 Rotate AOT control knob until the center of the target reticle is superimposed between the double Y reticle. Record AOT dial indication as RY = XXX.XX.

6.3.15.26 Rotate AOT control knob until the center of the target reticle is superimposed between the double SPIRAL reticle lines. Record AOT dial indication as RS = XXX.XX.

6.3.15.27 Record target R Theodolite elevation angle from horizontal ϕ_3.

6.3.15.28 Theodolite measurement of X_1' and X_2'.

6.3.15.28.1 Collimate Theodolite L and F. Read azimuth angle indicated by L Theodolite. Subtract angle from 360.00 deg and record as α_1. Read and record the azimuth angle indicated by F Theodolite as α_2.

6.3.15.28.2 Collimate Theodolite L and R. Read azimuth angle indicated by R Theodolite and record as α_3. Read and record the azimuth angle indicated by L Theodolite. Subtract angle from 360.00 deg and record as α'_1.

6.3.15.28.3 Calculate the values of the included angles between target L and F as X_1 and targets L and R as X_2.

$$X'_1 = \cos^{-1}\left\{\sin\phi_1 \sin\phi_2 + \cos\phi_1 \cos\phi_2 \cos\left[180 - (\alpha_1 + \alpha_2)\right]\right\}$$

$$X'_2 = \cos^{-1}\left\{\sin\phi_1 \sin\phi_3 + \cos\phi_1 \cos\phi_3 \cos\left[180 - (\alpha_3 + \alpha'_1)\right]\right\}$$

6.3.15.29 Perform the following calculations:

$$\sigma_L = \frac{360° + \theta_L - \phi_L}{12}$$

$$\sigma_F = \frac{360° + \theta_F - \phi_F}{12}$$

$$\sigma_R = \frac{360° + \theta_R - \phi_R}{12}$$

where:

θ_L = LS and ϕ_L = LY

θ_F = FS and ϕ_F = FY

θ_R = RS and ϕ_R = RY

6.3.15.30 Obtain the AOT Detent Calibration Data and record as follows:

E_L = L Elevation Calibration Data
E_F = F Elevation Calibration Data
E_R = R Elevation Calibration Data

D_L = L Azimuth Calibration Data
D_F = F Azimuth Calibration Data
D_R = R Azimuth Calibration Data

6.3.15.31 Perform the following calculations to determine the Left detent target vector in the Nav Base Coordinate System:

$$\begin{bmatrix} S_{XL} \\ S_{YL} \\ S_{ZL} \end{bmatrix}_{NB} = \begin{bmatrix} \cos E_L \sin \sigma_L \cos (\phi_L - D_L) + \sin E_L \cos \sigma_L \\ -\sin E_L \sin \sigma_L \sin D_L \cos (\phi_L - D_L) + \sin \sigma_L \cos D_L \sin (\phi_L - D_L) + \cos E_L \cos \sigma_L \sin D_L \\ -\sin E_L \sin \sigma_L \cos D_L \cos (\phi_L - D_L) - \sin \sigma_L \sin D_L \sin (\phi_L - D_L) + \cos E_L \cos \sigma_L \cos D_L \end{bmatrix}$$

6.3.15.32 Perform the following calculations to determine the Forward detent target vector in the Nav Base Coordinate System:

$$\begin{bmatrix} S_{XF} \\ S_{YF} \\ S_{ZF} \end{bmatrix}_{NB} = \begin{bmatrix} \cos E_F \sin \sigma_F \cos (\phi_F - D_F) + \sin E_F \cos \sigma_F \\ -\sin E_F \sin \sigma_F \sin D_F \cos (\phi_F - D_F) + \sin \sigma_F \cos D_F \sin (\phi_F - D_F) + \cos E_F \cos \sigma_F \sin D_F \\ -\sin E_F \sin \sigma_F \cos D_F \cos (\phi_F - D_F) - \sin \sigma_F \sin D_F \sin (\phi_F - D_F) + \cos E_F \cos \sigma_F \cos D_F \end{bmatrix}$$

6.3.15.33 Perform the following calculations to determine the Right Detent target vector in the Nav Base Coordinate System:

$$\begin{bmatrix} S_{XR} \\ S_{YR} \\ S_{ZR} \end{bmatrix}_{NB} = \begin{bmatrix} \cos E_R \sin \sigma_R \cos (\phi_R - D_R) + \sin E_R \cos \sigma_R \\ -\sin E_R \sin \sigma_R \sin D_R \cos (\phi_R - D_R) + \sin \sigma_R \cos D_R \sin (\phi_R - D_R) + \cos E_R \cos \sigma_R \sin D_R \\ -\sin E_R \sin \sigma_R \cos D_R \cos (\phi_R - D_R) - \sin \sigma_R \sin D_R \sin (\phi_R - D_R) + \cos E_R \cos \sigma_R \cos D_R \end{bmatrix}$$

6.3.15.34 Calculate AOT measurement of X_1' as follows:

$$X_1' = \cos^{-1} \frac{S_{XL} S_{XF} + S_{YL} S_{YF} + S_{ZL} S_{ZF}}{\sqrt{S_{XL}^2 + S_{YL}^2 + S_{ZL}^2} \times \sqrt{S_{XF}^2 + S_{YF}^2 + S_{ZF}^2}}$$

Verify $X_1 = X_1' \pm 0.08$ degrees.

6.3.15.35 Calculate AOT measurement of X_2' as follows:

$$X_2' = \cos^{-1} \frac{S_{XL} S_{XR} + S_{YL} S_{YR} + S_{ZL} S_{ZR}}{\sqrt{S_{XL}^2 + S_{YL}^2 + S_{ZL}^2} \times \sqrt{S_{XR}^2 + S_{YR}^2 + S_{ZR}^2}}$$

Verify $X_2 = X_2' \pm 0.08$ degrees.

6.3.16 Flight Rope Fixed Memory Bank Sum Check

NOTE: Before proceeding with this test, obtain a Computer Program listing of the flight program being tested. Prepare a list of the bank CKSM bugger words.

6.3.16.1 Verify G&N System in Standby Mode.

6.3.16.2 On K-148 enter the following sequence:

Press ERR RSET
VERB 56 ENTR
Observe VERB 05 NOUN 01 flashing

6.3.16.3 Record the CRT DSKY display indications.

Row 1 = AAAAA	Bank Sum
Row 2 = 000BB	Bank Number
Row 3 = CCCCC	(Bank CKSM bugger word)

Row 1 shall be the same as or the complement of the number displayed in Row 2. Row 3 indication shall be the same as the bugger word recorded above for the bank tested.

6.3.16.4 On K-148 enter VERB 33 ENTR

6.3.16.5 Repeat paragraphs 6.3.16.3 and 6.3.16.4 until all memory bank sums have been checked.

6.3.16.6 On K-148 enter VERB 34 ENTR.

6.3.17 RR/CDU Control Test

NOTE: RR CDU testing requires that the Rendezvous Radar is operating. The Rendezvous Radar is not activated until Integrated testing. To insure that the RR CDU's are operating properly the minimum requirements for RR CDU testing are presented here so that they may be included as part of the requirements to be demonstrated at the first opportunity after Rendezvous Radar activation.

6.3.17.1 Initialization

6.3.17.1.1 On K-148 enter the following:

VERB 36	ENTR, Wait 10 seconds
VERB 41 NOUN 72	ENTR
+04500	ENTR
+04500	ENTR
Wait 10 seconds	
VERB 41 NOUN 72	ENTR
+00000	ENTR
+00000	ENTR

VERB 04 NOUN 06 shall flash.
Verify Row 2 = 00002

If Row 2 display is correct proceed to next step. If it is not correct, enter the following on K-148:

VERB 22	ENTR
00002	ENTR

6.3.17.1.2 On K-148 enter the following:

VERB 33	ENTR

Wait 25 seconds before continuing.

6.3.17.2 CDU Fine and CDU Coarse Error

6.3.17.2.1 Set up analog recorder to monitor the following:

Meas. No.	Signal Name
a. GG 3311	Shaft CDU Fine Error
b. GG 3312	Shaft CDU Coarse Error
c. GG 3321	Trunnion CDU Fine Error
d. GG 3322	Trunnion CDU Coarse Error

6.3.17.2.2 On K-148 enter the following:

VERB 36 ENTR, Wait 10 seconds
VERB 41 NOUN 72 ENTR
+04500 ENTR
+04500 ENTR
VERB 04 NOUN 06 shall flash.
Verify Row 2 = 00002
VERB 33 ENTR

Wait 10 seconds. Verify on CRT that RR CDU Trunnion and Shaft angles indicate 045.00±000.30 deg.

6.3.17.2.3 Verify the following signals on the CRT:

RR Shaft 1X Sine (GG 3304)	18.4±1.84 VRMS
RR Shaft 1X Cos (GG 3305)	18.4±1.84 VRMS
RR Trunnion 1X Sine (GG 3324)	18.4±1.84 VRMS
RR Trunnion 1X Cos (GG 3325)	18.4±1.84 VRMS

6.3.17.2.4 Verify CDU Fine Errors (GG 3311, GG 3321) do not exceed 0.07 volts.

6.3.17.2.5 Verify CDU Coarse Errors (GG 3312, GG 3322) do not exceed 0.680 volts.

6.3.17.3 RR CDU Fail.

6.3.17.3.1 On K-148 enter the following:

VERB 36 ENTR, Wait 10 seconds
VERB 41 NOUN 72 ENTR
+00100 ENTR
+00000 ENTR
VERB 04 NOUN 06 shall flash
Verify Row 2 = 00002
VERB 33 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00001 ENTR

Verify RR CDU Fail and Tracker Alarm come ON in approximately 10 seconds.

6.3.17.3.2 Press ERR RSET
VERB 36 ENTR, Wait 10 seconds
VERB 41 NOUN 72 ENTR
+00000 ENTR
+00000 ENTR
VERB 44 ENTR

6.3.17.3.2 (Continued)

+00100 ENTR
VERB 04 NOUN 06 shall flash
Verify Row 2 = 00002
VERB 33 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00001 ENTR

Verify RR CDU Fail and Tracker Alarm come ON in approximately 10 seconds.

6.3.17.3.3 On K-148 enter the following:

Press ERR RSET
VERB 36 ENTR, Wait 10 seconds
VERB 41 NOUN 72 ENTR
+03375 ENTR
+00000 ENTR
VERB 04 NOUN 06 shall flash
Verify Row 2 = 00002
VERB 33 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00001 ENTR

Verify RR CDU Fail and Tracker Alarm come ON in approximately 10 seconds.

6.3.17.3.4 On K-148 enter the following:

Press ERR RSET
VERB 36 ENTR, Wait 10 seconds
VERB 41 NOUN 72 ENTR
+00000 ENTR
+03375 ENTR
VERB 04 NOUN 06 shall flash
Verify Row 2 = 00002
VERB 33 ENTR
VERB 21 NOUN 10 ENTR
00012 ENTR
00001 ENTR

Verify RR CDU Fail and Tracker Alarm come ON in approximately 10 seconds.

6.3.17.3.5 On K-148 enter the following:

Press ERR RSET
VERB 44 ENTR
VERB 41 NOUN 72 ENTR
+00000 ENTR
+00000 ENTR
VERB 44 ENTR

APPENDIX I

MEASUREMENT TOLERANCES

Signal	Link	Signal Name	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
GG 1020	4*	+14 vdc LGC Supply	14.0±0.4 vdc	0%
GG 1030	4	+4 vdc LGC Supply	4.0±0.2 vdc	0%
GG 1040	5**	+120 vdc PIPA Supply	120±6.0 vdc	1%
GG 1070	4	+4 vdc CDU Supply	4.0±0.2 vdc	0%
GG 1100	4	-28 vdc Supply	-27.5±6.0 vdc	0%
GG 1110	5	2.5 vdc Telemetry Bias No. 1	2.5±.06 vdc	0%
GG 1201	5	IMU 28V 800 cps 1%	28.00±0.56V rms	1%
GG 1202	4	IMU 28V 800 cps 5%	28.0±1.4V rms	0.33%
GG 1203	4	IMU 28V 800 cps 5%	28.0±2.1V rms	0.33%
GG 1331	5	3.2 kc 28V Supply 1%	28.6±0.56V rms	1%
GG 1500	4	+28 vdc IMU OPER BUS	28.0-3.5, +6.5 vdc	0%
GG 1510	4	+28 vdc IMU STBY BUS (Stby mode)	28.0-6.0, +5.5 vdc	0%
GG 1513X	5	+28 vdc IMU STBY/OFF	28.0±1 vdc	0%
GG 1520	4	+28 vdc LGC OPER BUS	28.0-3.5, +6.5 vdc	0%
GG 1523X	5	+28 vdc LGC Operate	28.0±1 vdc	0%
GG 2001	5	X PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
GG 2021	5	Y PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
GG 2041	5	Z PIPA S.G. OUT IN PH	+2.5±0.128V rms at 1g	3%
GG 2106	4	IG Servo Error Total	0.0±60 MV rms at null	1%
GG 2110	4	IG Torque Motor Current	0.125 AMP Max during any fine Align Torque	0%
GG 2112	5	IG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 2113	5	IG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 2136	4	MG Servo Error Total	0.0±60 MV rms at null	1%
GG 2140	4	MG Torque Motor Current	0.125 AMP Max during any fine Align Torque	0%
GG 2142	5	MG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 2143	5	MG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 2166	4	OG Servo Error Total	0.0±60 MV rms at null	1%
GG 2170	4	OG Torque Motor Current	0.125 AMP Max during fine Align Torque	0%
GG 2172	5	OG 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 2173	5	OG 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 2219	5	Pitch Attitude Error	5.05±0.5V rms at 17°	0.67%
GG 2221	4	IG CDU Coarse Error	0.0±0.68V rms at null	0.29%
GG 1510	4	+28 vdc IMU STBY BUS (Oper. mode)	28.0-4.5, +4.5 vdc	0%

* Link 4 - PSAAM Output Signal

** Link 5 - SCA Output Signal

APPENDIX I (Continued)

Signal	Link	Signal Name	G&N Test Requirement	PSAAM and/or SCA Uncertainty % of Full Scale
GG 2249	5	YAW Attitude Error	5.05±0.5V rms at 17°	0.67%
GG 2251	4	MG CDU Coarse Error	0.0±0.68V rms at null	0.29%
GG 2279	5	Roll Attitude Error	5.05±0.5V rms at 17°	0.67%
GG 2281	4	OG CDU Coarse Error	0.0±0.68V rms at null	0.29%
GG 2300	5	PIPA Temperature	130.5±1.5°F in Operate	2%
GG 2302	4	IMU Heater Current On	28±1 vdc	0%
GG 3304	5	RR Shaft 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 3305	5	RR Shaft 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 3312	4	RR Shaft CDU Coarse Error	0.0±0.68V rms at null	1%
GG 3322	4	RR Trunnion CDU Coarse Error	0.0±0.68V rms at null	1%
GG 3324	5	RR Trunnion 1X Resolver Out-Sine	18.4±1.84V rms at 45°	2.5%
GG 3325	5	RR Trunnion 1X Resolver Out-Cosine	18.4±1.84V rms at 45°	2.5%
GG 4300	4	LGC Temperature	87.5±42.5°F	0.23%
GG 6020	4	PIPA Calibration Module Temperature	67.5±22.5°F	0.23%
GG 6021	4	PSA Temperature	85±25.0°F	0%
NG 1336	4	PHDIFF 3.2KC 28V/LGC SYNC	0° ±10°	3%
NG 1021	4	14 VDC LGC Noise RMS	0.2 VRMS Max	0%
NG 1022	4	14 VDC LGC Noise Peak	5 volts with rise time of 2 to 5 μsec	0%
NG 1031	4	4 VDC LGC Noise RMS	0.2 VRMS Max	0%
NG 1032	4	4 VDC LGC Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1071	4	4 VDC CDU Noise RMS	0.1 VRMS Max	0%
NG 1072	4	4 VDC CDU Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1501	4	28 VDC IMU Operate Noise RMS	1.0 VRMS Max	0%
NG 1502	4	28 VDC IMU Operate Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1511	4	28 VDC IMU Standby Noise RMS	1.0 VRMS Max	0%
NG 1512	4	28 VDC IMU Standby Noise Peak	5 volts with rise time of 2 to 50 μsec	0%
NG 1521	4	28 VDC LGC Operate Noise RMS	2.0 VRMS Max	0%
NG 1522	4	28 VDC LGC Operate Noise Peak	5.0 volts with rise time of 2 to 50 μsec	0%

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PROCESS SPECIFICATION FOR CLEANING AND LUBRICATION OF ASSEMBLIES CONTAINING BEARINGS AND INDIVIDUAL BEARINGS

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				MIT	NASA

This specification consists of page 1 to 9 inclusive.

APPROVALS	JWH 9-10-70 NASA/MSC	9-2-70	~~MIT/IL~~ Not Req'd	W. Chin, Engr 6/29/70 KIC 6/29/70

4-3.2 Dwell Level and Noise Count Test

4-3.2.1 Using a Smooth-Rator or equivalent check the bearing rotating at 600 RPM. The noise count shall not exceed the values in Table I or, Table II after observing the bearing for a minimum of 10 seconds.

TABLE I (NEW BEARING)

ABEC Class	Dwell Level	Noise Count
7	4	2
5	5	2

NOTE: For bearings having an I.D. greater than 0.500 the Dwell Level shall not exceed 7 and Noise Count shall not exceed 5.

4-3.2.1.1 Table II applies to refurbished bearings (other than gear box bearings) after a second cleaning if, Table I requirements are not met.

TABLE II (REFURBISHED BEARING)

ABEC Class	Dwell Level	Noise Count
7	6	4
5	7	4

NOTE: For refurbished bearings having an I.D. greater than 0.500 the Dwell Level shall not exceed 9 and Noise Count shall not exceed 7.

5 PREPARATION FOR DELIVERY

5-1 This section is not applicable to this specification.

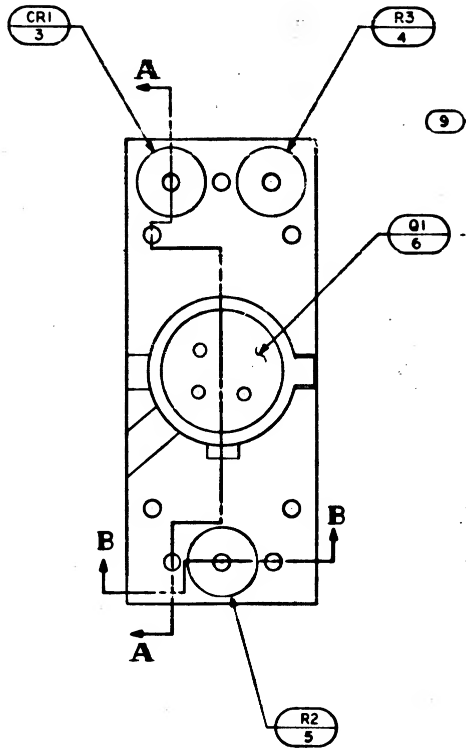
6 NOTES

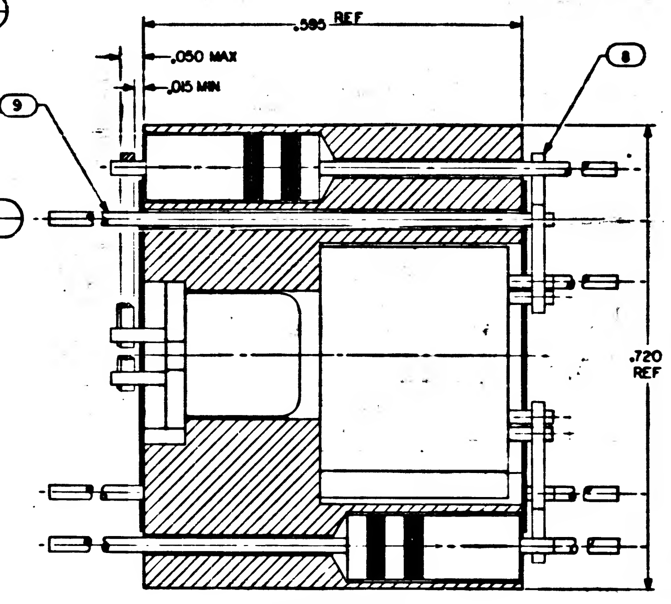
6-1 STORAGE

6-1.1 Each container of lubricant shall be marked to indicate date of manufacture and expiration date as specified on SCD 1012051 and SCD 1012050.

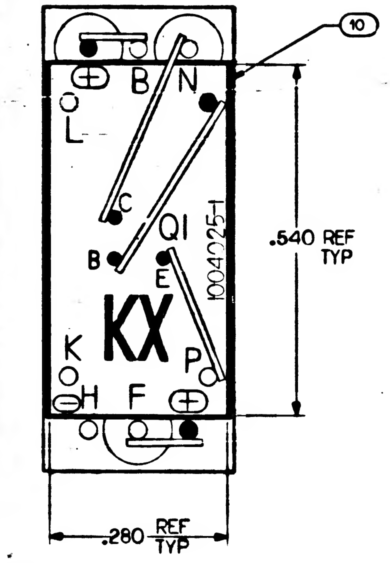
NOTICE – WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	NOTES ADDED	8-16-62	





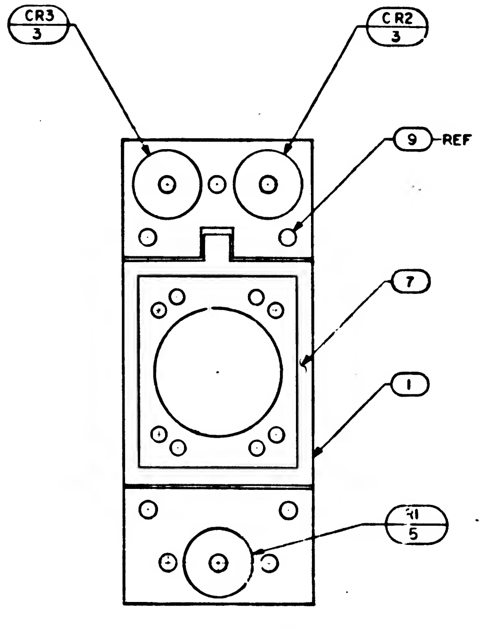
SECTION A-A



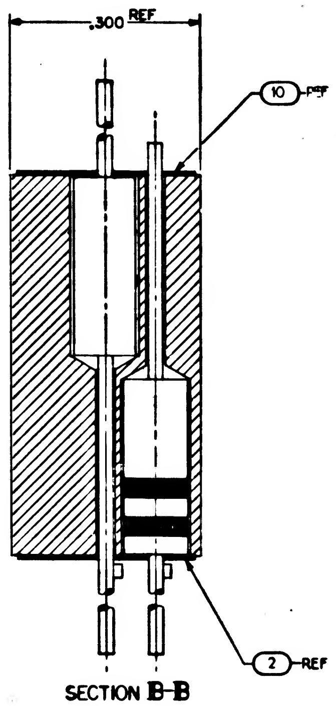
TOP & BOTTOM VIEW
WITH FILMS & WIRING
SHOWN

FOR INFORMATION ONLY

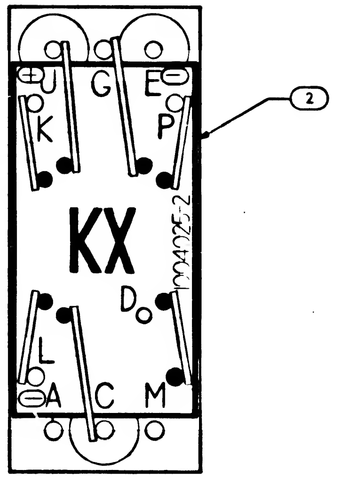
CLASS B RELEASE TDR No. 00004 DATE 8-9-62



FILM & WIRING REMOVED
FOR CLARITY



SECTION B-B



REFERENCE:-
1. TEST IN ACCORDANCE WITH TEST SPEC. ATP 1003000.
2. SCHEMATIC 1006000

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. ALL WELDING PER ND 1002005.
3. ● DENOTES LEADS TO BE CUT AFTER WELDING 1/32 MAX ABOVE WELD.

PART NO.	NO. TURNS BETWEEN PINS P&B	TYPE DESIGNATOR	HOUSING COLOR
1003000-1	20	KA	YELLOW
1003000-2	28	KB	RED
1003000-3	50	KC	BLUE

QTY REQD	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004025-1	MYLAR FILM (TOP)	10
AR	1006758-2	WIRE, ELECTRICAL, ROUND	9
AR	1006757	WIRE, ELECTRICAL, .010 X .020	8
1	1003027	ASSEMBLY "K" BIT	7
1	1006752	TRANSISTOR NPN, LOGIC	6
2	1006750-41	RESISTOR 470Ω 1/4 W 5%	5
1	1006750-56	RESISTOR, 2K 1/4W 5%	4
3	1006751	DIODE, SILICON LOGIC	3
1	1004025-2	MYLAR FILM (BOTTOM)	2
1	1004018	MODULE, INJECTION MOULDING	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG NO CONTRACT
DRAWN S. DELL'ANNO DATE 8-7-62
CHECKED
APPROVAL 8/7/62
APPROVAL 8/7/62
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

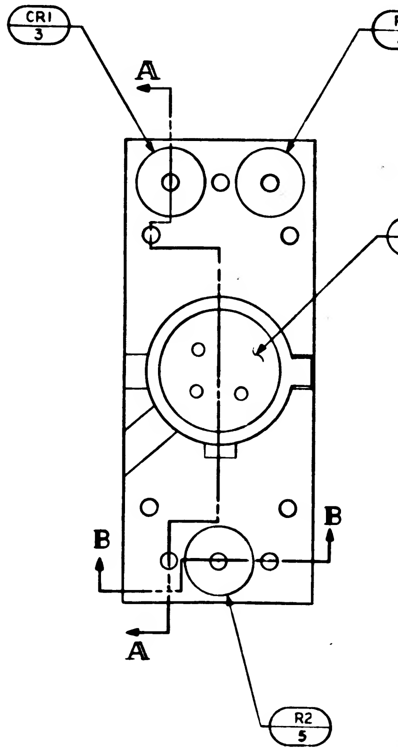
MODULE ASSEMBLY
"K" CORE CIRCUIT
(TAB)

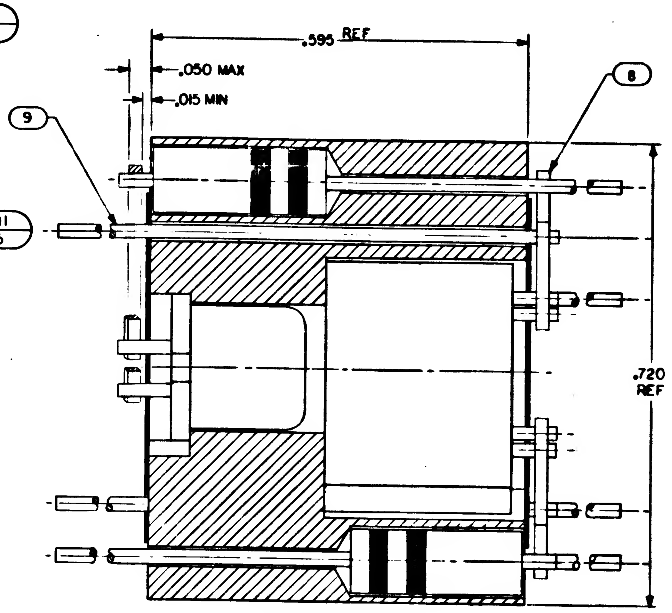
CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003000
SCALE 10/1
WT
SHEET OF

1003000 A

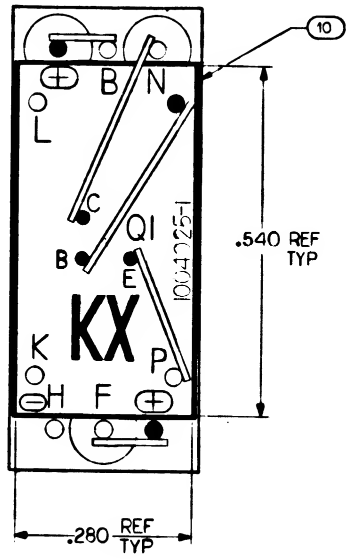
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	NOTES ADDED	8-16-62	
B	M/L FIND NO.1 PART NO. WAS: 1004018,'S: SEE TAB-CHART. FIND NO 1 ADDED TO TAB-CHART. ADDED NEXT ASS'Y NO S	9-5-62	9/5/62
(M)	OBSOLETE PER TDRR 00183	12-18-62	WE 12/24/62





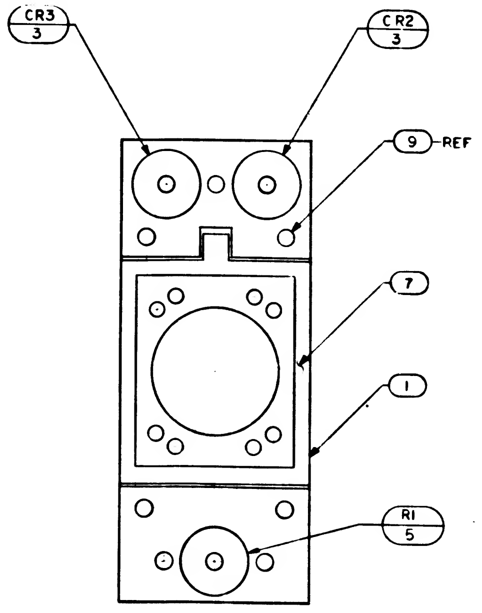
SECTION A-A



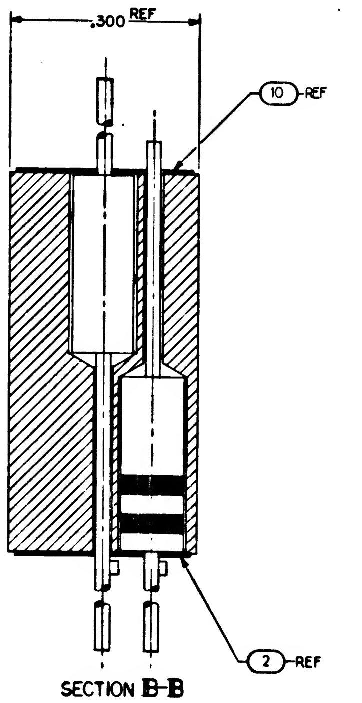
TOP & BOTTOM VIEW WITH FILMS & WIRING SHOWN

FOR INFORMATION ONLY

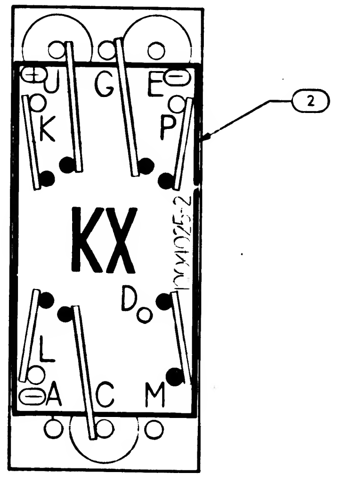
CLASS B RELEASE TDR No. 00004 DATE 8-9-62



FILM & WIRING REMOVED FOR CLARITY



SECTION B-B



REFERENCE:-
1. TEST IN ACCORDANCE WITH TEST SPEC. ATP 1003000.
2. SCHEMATIC 1006000

THIS DRAWING OBSOLETE DO NOT USE
SUPERSEDED BY

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. ALL WELDING PER ND 1002005.
3. ● DENOTES LEADS TO BE CUT AFTER WELDING 1/32 MAX ABOVE WELD.

PART NO.	NO. TURNS BETWEEN PINS P&B	TYPE DESIGNATOR	HOUSING COLOR	FIND NO.1
1003000-1	20	KA	YELLOW	1004018-1
1003000-2	28	KB	RED	1004018-2
1003000-3	50	KC	BLUE	1004018-3

QTY REQD	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004025-1	MYLAR FILM (TOP)	10
AR	1006758-2	WIRE, ELECTRICAL, ROUND	9
AR	1006757-	WIRE, ELECTRICAL .010 X .020	8
1	1003027	ASSEMBLY "K" BIT	7
1	1006752	TRANSISTOR NPN, LOGIC	6
2	1006750-41	RESISTOR 470Ω 1/4 W 5%	5
1	1006750-56	RESISTOR, 2K 1/4W 5%	4
3	1006751	DIODE, SILICON LOGIC	3
1	1004025-2	MYLAR FILM (BOTTOM)	2
1	SEE TAB-CHART	MODULE, INJECTION MOULDING	1

LIST OF MATERIALS

1003041	
1003040	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

M I T
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT
DRAWN S. DELL'ANNO DATE 8-7-62
CHECKED Joe Marton
APPROVAL W. E. Tanner 8/7/62
APPROVAL 8/7/62
NASA APPROVAL Jack Barnard
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

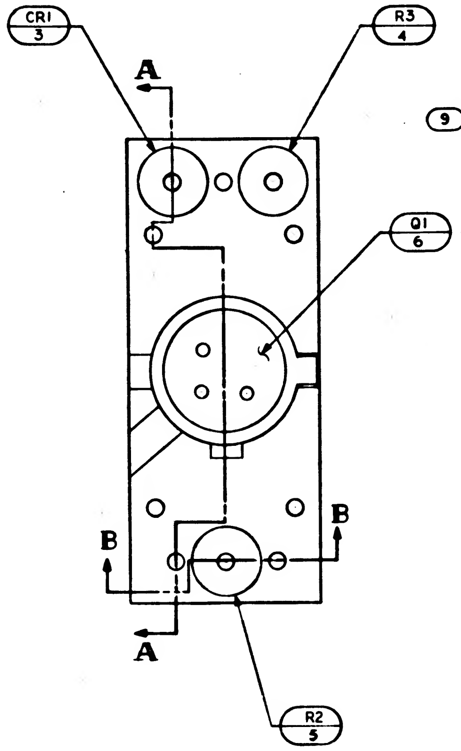
MODULE ASSEMBLY "K" CORE CIRCUIT (TAB)

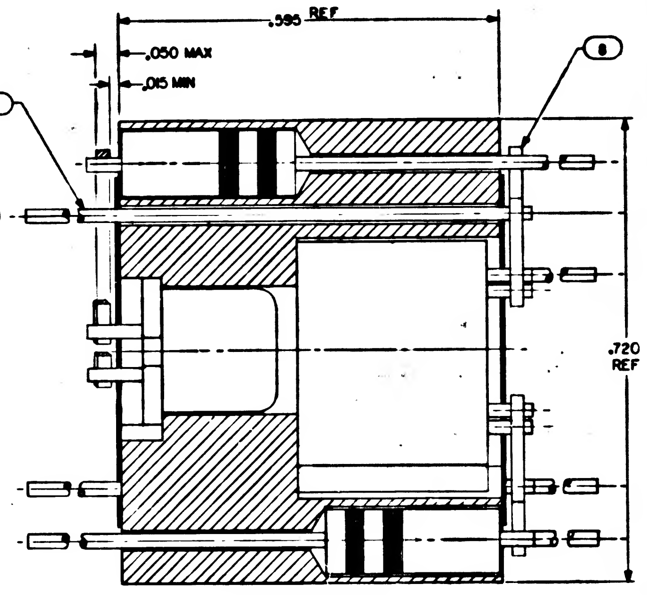
CODE IDENT NO
SIZE E
NASA DRAWING NO 1003000
SCALE 10/1 WT SHEET 1 OF 1

1003000

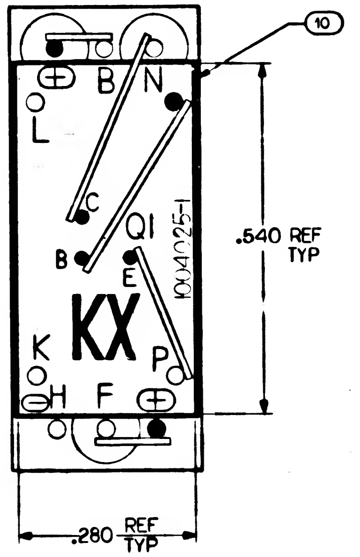
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	NOTES ADDED	8-16-62	





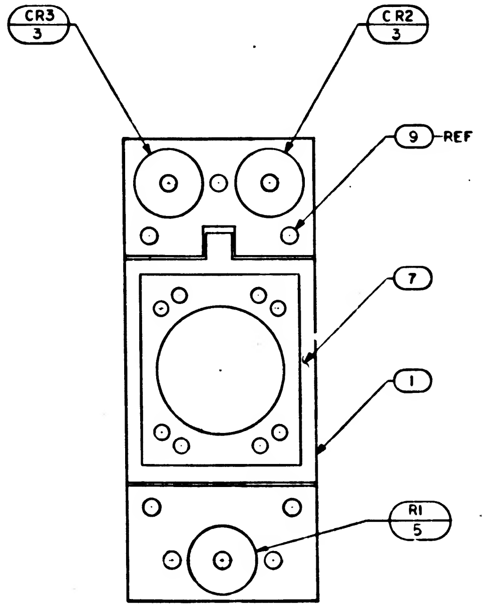
SECTION A-A



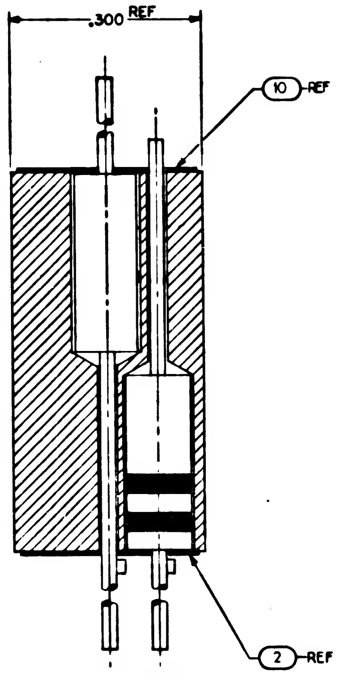
TOP & BOTTOM VIEW
WITH FILMS & WIRING
SHOWN

FOR INFORMATION ONLY

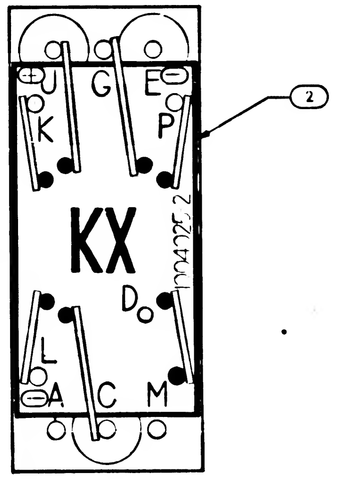
CLASS B RELEASE TDR No. 00004 DATE 8-9-62



FILM & WIRING REMOVED
FOR CLARITY



SECTION B-B



REFERENCE:-
1. TEST IN ACCORDANCE WITH TEST SPEC. ATP 1003000.
2. SCHEMATIC 1006000

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. ALL WELDING PER ND 1002005.
3. ● DENOTES LEADS TO BE CUT AFTER WELDING 1/32 MAX ABOVE WELD.

PART NO.	NO. TURNS BETWEEN PINS P & B	TYPE DESIGNATOR	HOUSING COLOR
1003000-1	20	KA	YELLOW
1003000-2	28	KB	RED
1003000-3	50	KC	BLUE

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004025-1	MYLAR FILM (TOP)	10
AR	1006758-2	WIRE, ELECTRICAL, ROUND	9
AR	1006757	WIRE, ELECTRICAL .010 X .020	8
1	1003027	ASSEMBLY "K" BIT	7
1	1006752	TRANSISTOR NPN, LOGIC	6
2	1006750-41	RESISTOR 470Ω 1/4 W 5%	5
1	1006750-56	RESISTOR, 2K 1/4W 5%	4
3	1006751	DIODE, SILICON LOGIC	3
1	1004025-2	MYLAR FILM (BOTTOM)	2
1	1004018	MODULE, INJECTION MOULDING	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT
DRAWN S. DELL'ANNO DATE 8-7-62
CHECKED
APPROVAL 8/7/62
APPROVAL 8/7/62
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MODULE ASSEMBLY
"K" CORE CIRCUIT
(TAB)

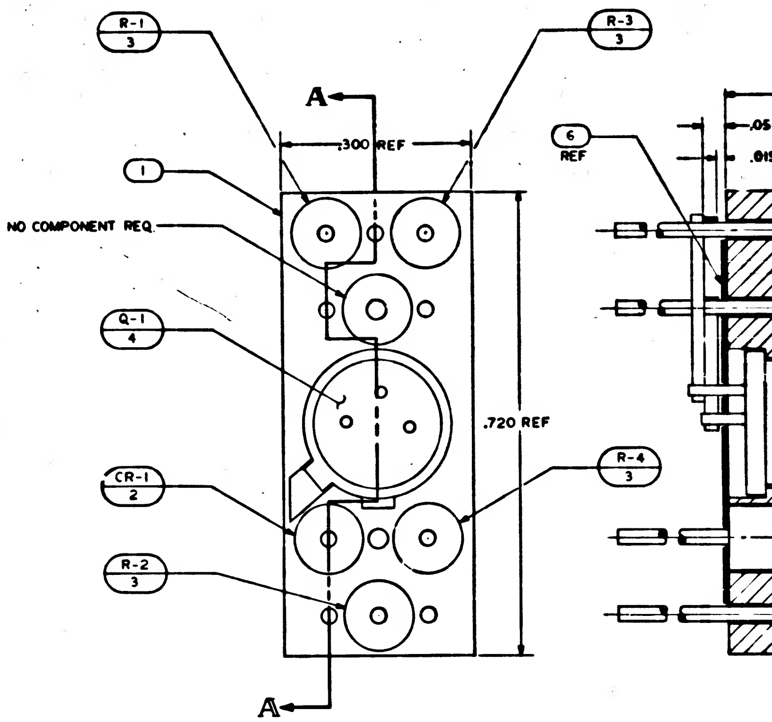
CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003000
SCALE 10/1
WT
SHEET OF

1003000 A

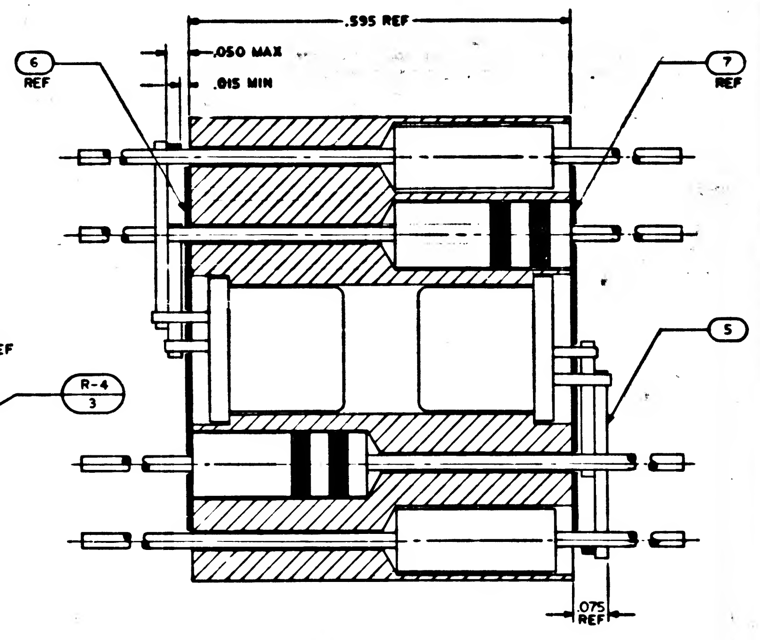
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS

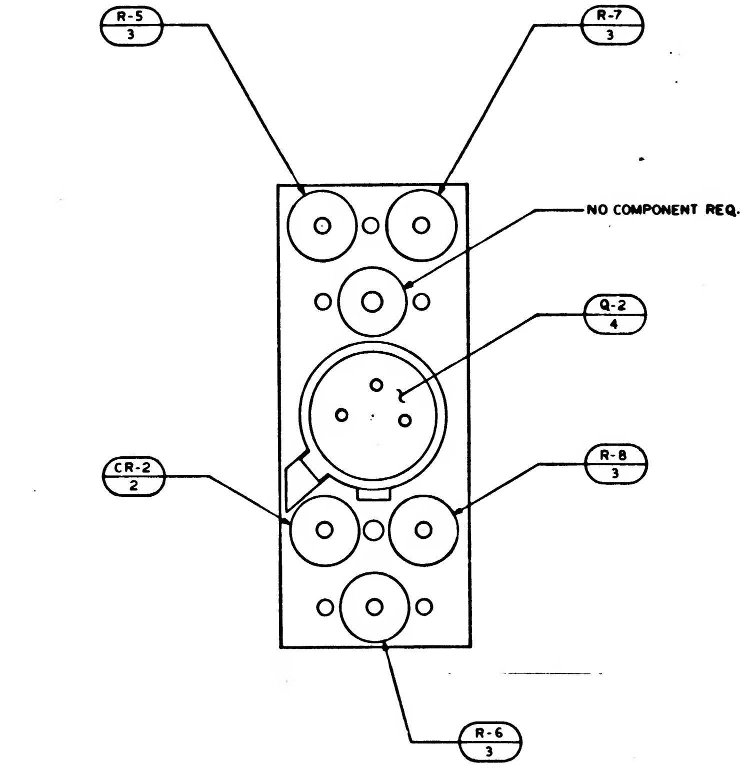
SYM	DESCRIPTION	DATE	APPROVAL
A	NOTES ADDED	8-16-62	

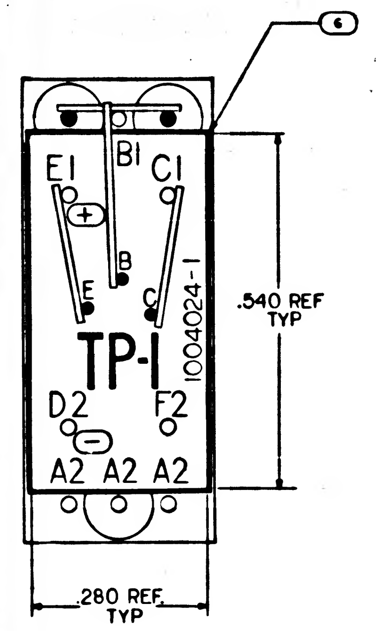


FILMS AND WIRING REMOVED FOR CLARITY

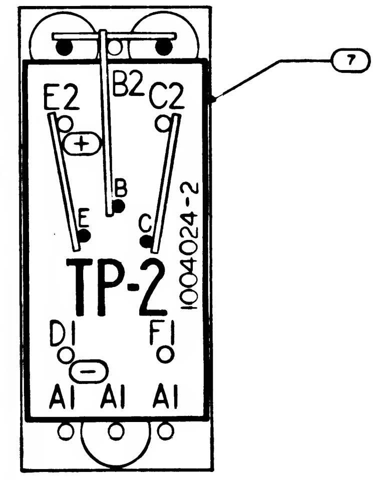


SECTION A-A





TOP & BOTTOM VIEWS WITH FILM & WIRING SHOWN



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 0000 4 DATE 8-9-62

REFERENCE:
1. TEST IN ACCORDANCE WITH TEST SPEC ATP 1003001
2. SCHEMATIC 1006001

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ALL WELDING PER ND 1002005
3. ● DENOTES LEADS TO BE CUT AFTER WELDING 1/32 MAX ABOVE WELD.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
1	1004024-2	FILM, WIRING (BOTTOM)	7
1	1004024-1	FILM, WIRING (TOP)	6
AR	1006757	WIRE ELECTRICAL (.010 X .020)	5
2	1006753	TRANSISTOR, PNP, LOGIC	4
8	1006750-56	RESISTOR, 2K 1/4 WATT 5%	3
2	1006751	DIODE, SILICON, LOGIC	2
1	1004017-1	MODULE, INJECTION MOULDING	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
SEQ NO. CONTRACT

DRAWN BONARRIGO DATE 8-7-62
CHECKED
APPROVAL 8/17/62
APPROVAL 8/7/62
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MODULE ASSEMBLY
TP CIRCUIT

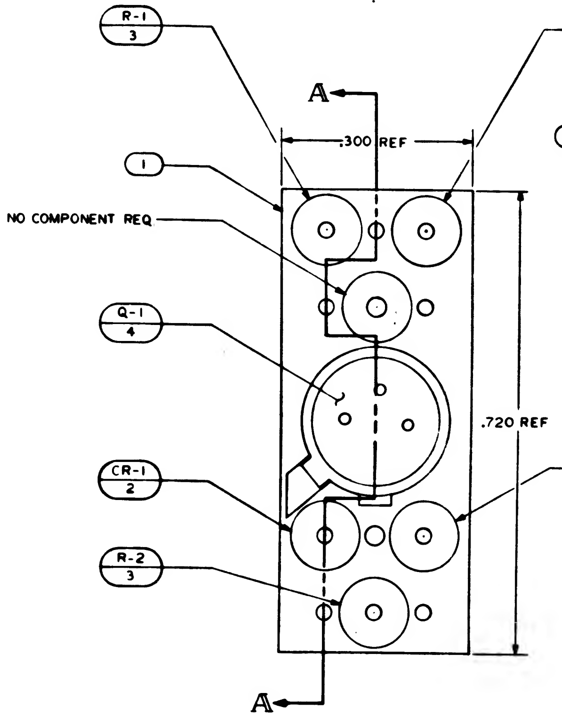
CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003001
SCALE 10/1
WT
SHEET OF

1003001 A

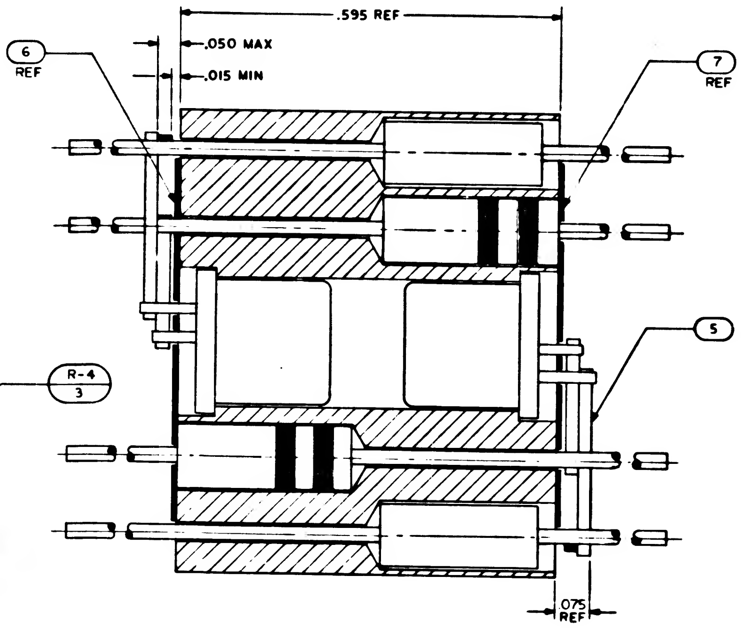
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS

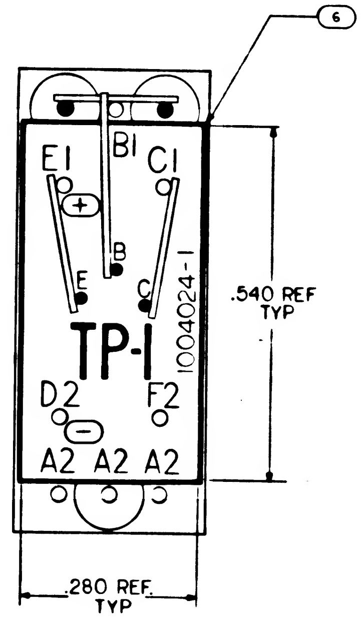
SYM	DESCRIPTION	DATE	APPROVAL
A	NOTES ADDED	8-16-62	
B	NEXT ASSEMBLY NO.'S ADDED	9-6-62	
	OBSOLETE PER TDRR 22.13	10-18-62	

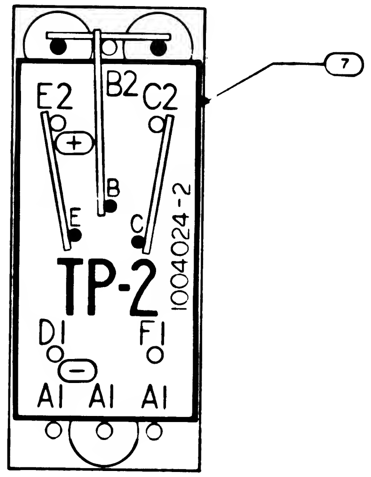


FILMS AND WIRING
REMOVED FOR CLARITY

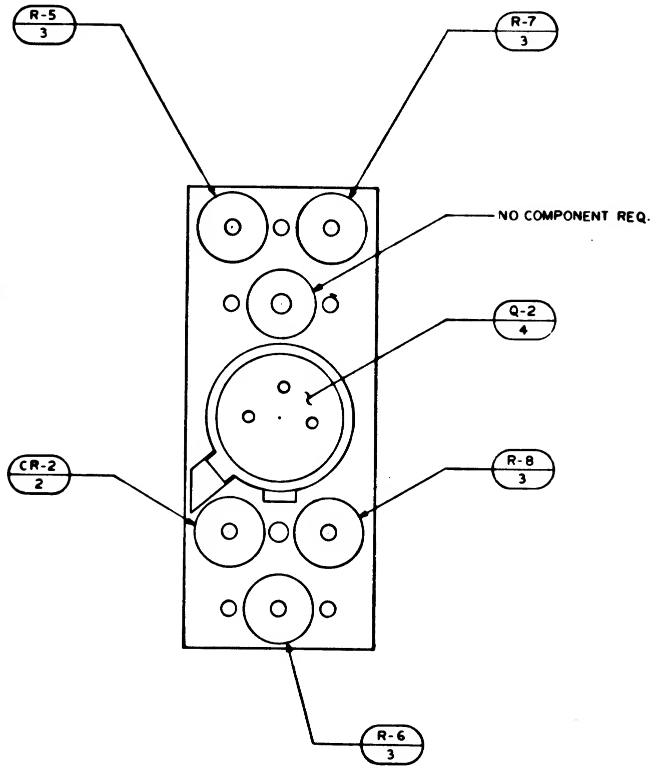


SECTION A-A





TOP & BOTTOM VIEWS
WITH FILM & WIRING SHOWN



FOR INFORMATION ONLY
CLASS B RELEASE TDR No. 0000 4 DATE 8-9-62

THIS DRAWING
OBSOLETE
DO NOT USE
SUPERSEDED BY

REFERENCE:
1. TEST IN ACCORDANCE WITH TEST SPEC ATP 1003001
2. SCHEMATIC 1006001

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ALL WELDING PER ND 1002005
3. ● DENOTES LEADS TO BE CUT AFTER WELDING 1/32 MAX ABOVE WELD.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004024-2	FILM, WIRING (BOTTOM)	7
1	1004024-1	FILM, WIRING (TOP)	6
AR	10C6757	WIRE ELECTRICAL (.010 X .020)	5
2	1006753	TRANSISTOR, PNP, LOGIC	4
8	1006750-56	RESISTOR, 2K 1/4 WATT 5%	3
2	1006751	DIODE, SILICON, LOGIC	2
1	1004017-1	MODULE, INJECTION MOULDING	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003001	
1003040	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT

DRAWN BONARRIGO DATE 8-7-62
CHECKED
APPROVAL 8/17/62
APPROVAL 8/7/62
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

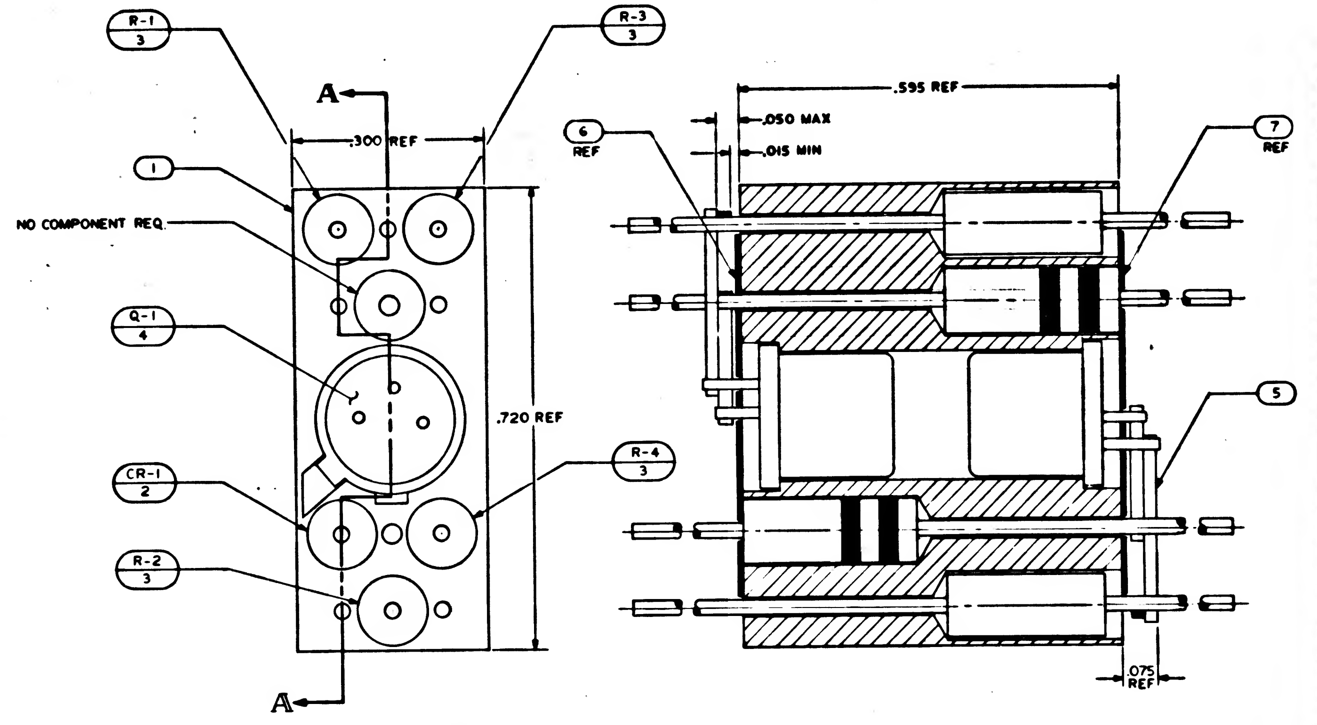
MODULE ASSEMBLY
TP CIRCUIT

CODE IDENT NO. SIZE E NASA DRAWING NO 1003001
SCALE 10/1 WT SHEET OF

1003001 B

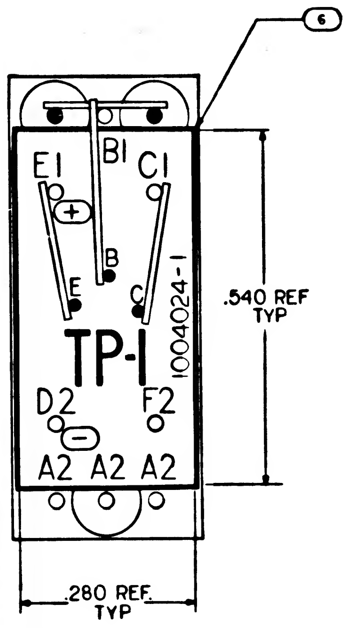
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	NOTES ADDED	8-16-62	

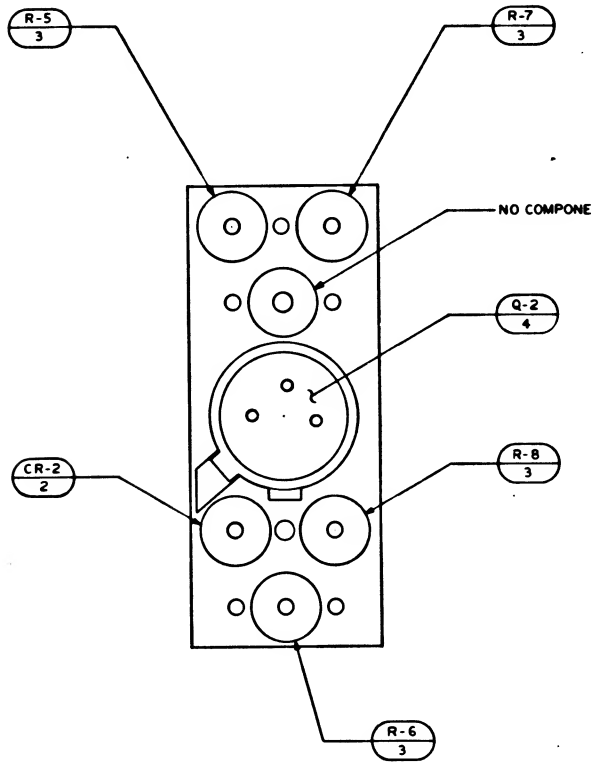


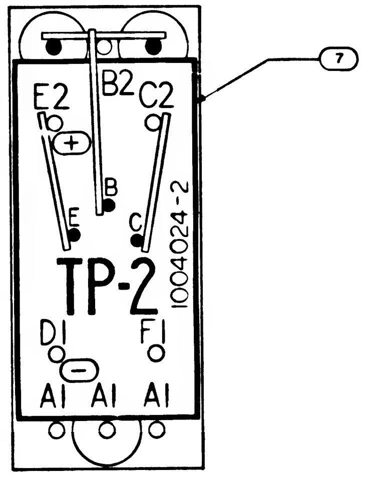
FILMS AND WIRING REMOVED FOR CLARITY

SECTION A-A



TOP & BOTTOM VIEWS WITH FILM & WIRING SHOWN





FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00004 DATE 8-9-62

REFERENCE:
1. TEST IN ACCORDANCE WITH TEST SPEC ATP 1003001
2. SCHEMATIC 1006001

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ALL WELDING PER ND 1002005
3. ● DENOTES LEADS TO BE CUT AFTER WELDING 1/32 MAX ABOVE WELD.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004024-2	FILM, WIRING (BOTTOM)	7
1	1004024-1	FILM, WIRING (TOP)	6
AR	1006757	WIRE ELECTRICAL (.010 X.020)	5
2	1006753	TRANSISTOR, PNP, LOGIC	4
8	1006750-56	RESISTOR, 2K 1/4 WATT 5%	3
2	1006751	DIODE, SILICON, LOGIC	2
1	1004017-1	MODULE, INJECTION MOULDING	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT

DRAWN BONARRIGO DATE 8-7-62
CHECKED
APPROVAL 8/17/62
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

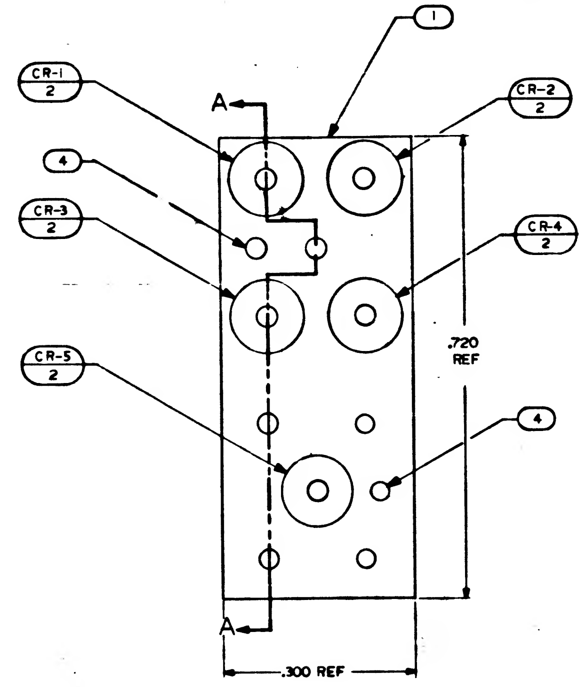
MODULE ASSEMBLY
TP CIRCUIT

CODE IDENT NO. SIZE E NASA DRAWING NO. 1003001
SCALE 10/1 WT SHEET OF

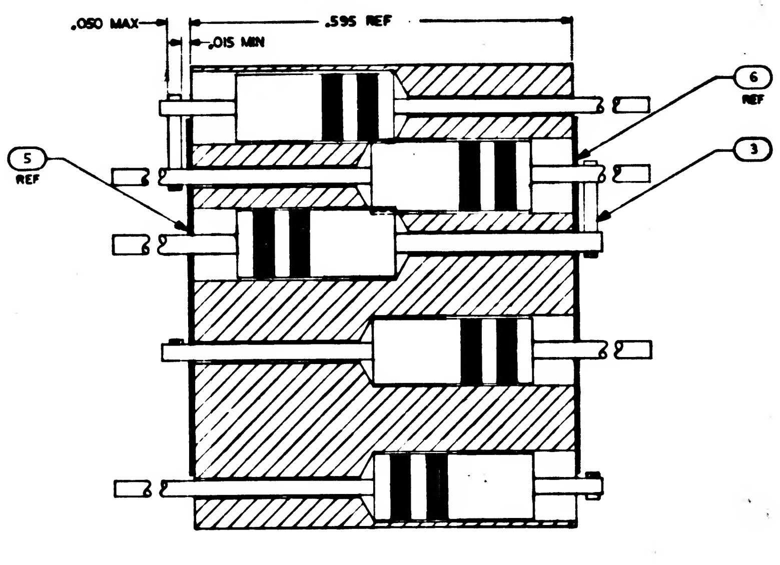
1003001 A

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED FURNISHED OR IN ANY WAY SUPPLIED THE SAID DRAWINGS SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE USE OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

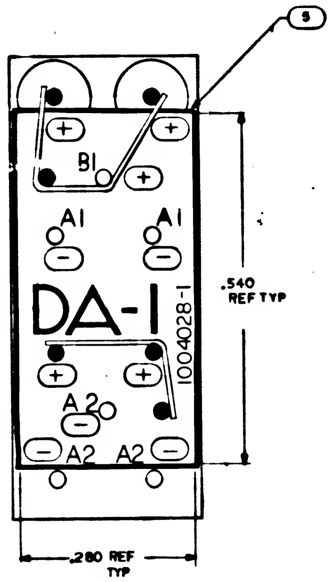
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	NOTES ADDED	8-16-62	



FILMS AND WIRING REMOVED FOR CLARITY



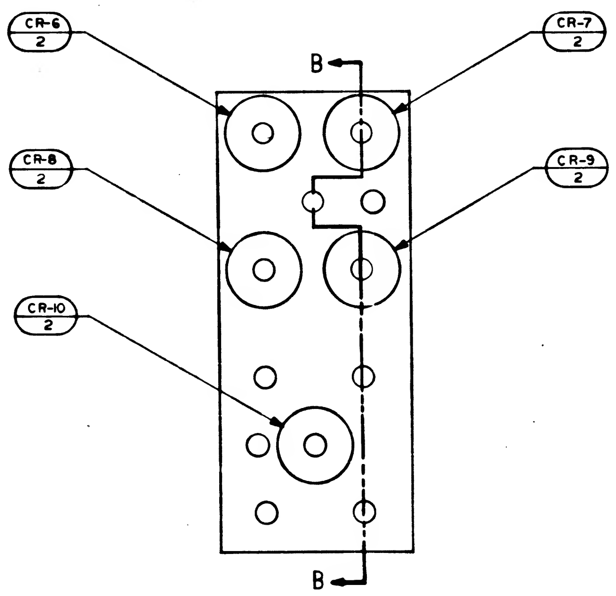
SECTION A-A

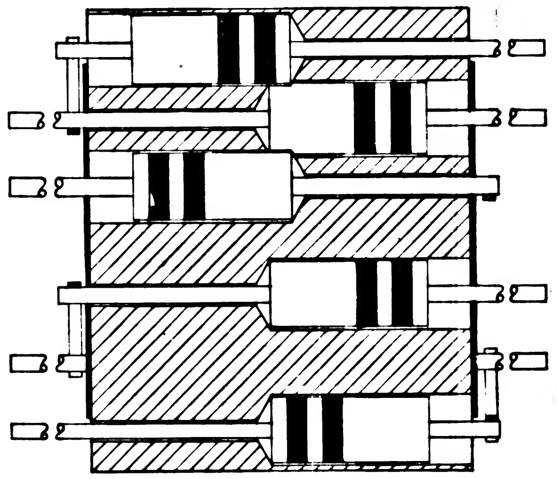


TOP & BOTTOM VIEW WITH FILM & WIRING SHOWN

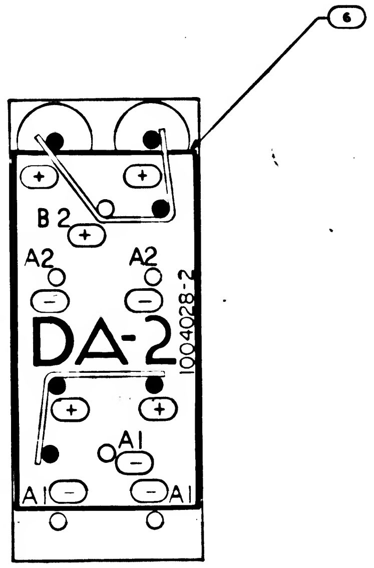
FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00004 DATE 8-9-62





SECTION B-B



REFERENCE :

1. TEST IN ACCORDANCE WITH TEST SPEC ATP 1003002
2 SCHEMATIC 1006002

NOTES :

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ALL WELDING PER ND-1002005
3. ● DENOTES LEADS TO BE CUT AFTER WELDING $\frac{1}{32}$ MAX ABOVE WELD

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004028-2	FILM, WIRING (BOTTOM)	6
1	1004028-1	FILM, WIRING (TOP)	5
AR	1006758-2	WIRE, ELECTRICAL, ROUND	4
AR	1006757	WIRE, ELECTRICAL (.010 x .020)	3
10	1006751	DIODE, SILICON, LOGIC	2
1	1004022-1	MODULE, INJECTION MOULDING	

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

M I T
INSTRUMENTATION LAB
CAMBRIDGE MASS
DRAWN DEMPSKI DATE 8-9-62
CHECKED
APPROVAL 8/9/62
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MODULE ASSEMBLY
DA CIRCUIT

CODE IDENT NO
SIZE E
NASA DRAWING NO. 1003002
SCALE 10:1
WT
SHEET OF

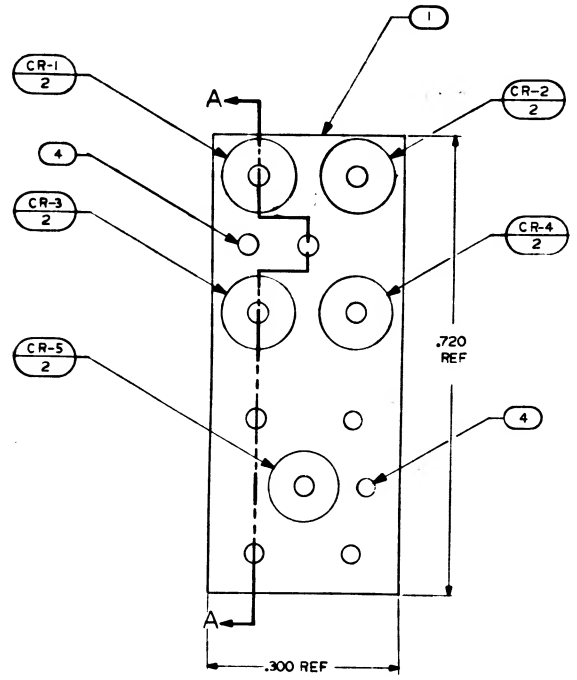
1003002 A

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

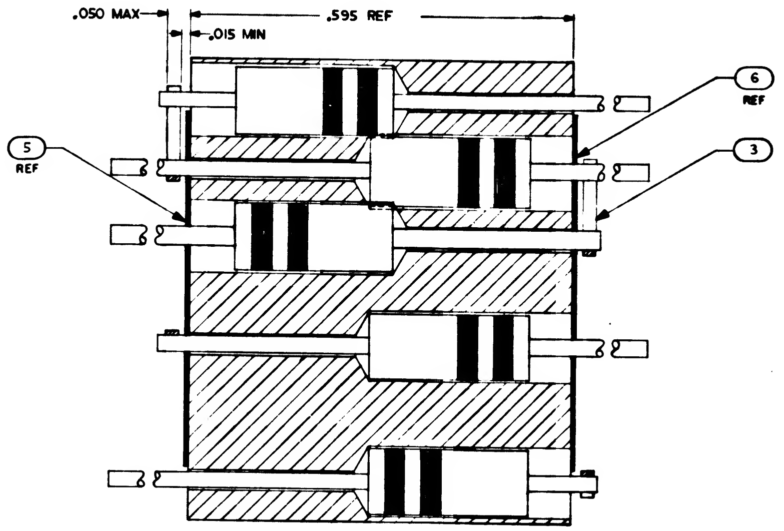
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	NOTES ADDED	8-16-62	
B	ADDED NEXT ASSY NO.	9-6-62	
	OBSOLETE PER TDRR 00193	12-18-62	12/20/62

FOR INFORMATION ONLY

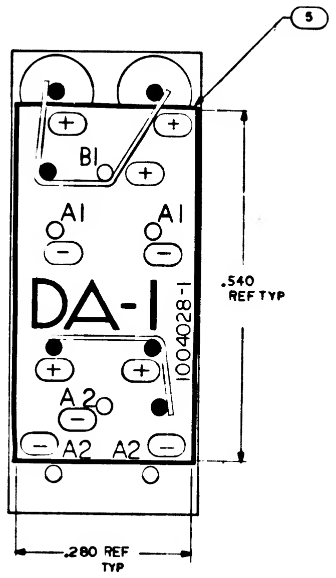
CLASS B RELEASE TDR No. 00004 DATE 8-9-62



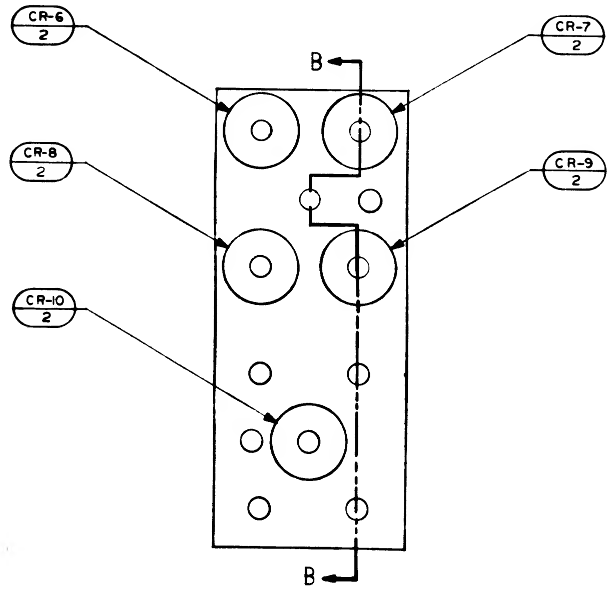
FILMS AND WIRING REMOVED FOR CLARITY

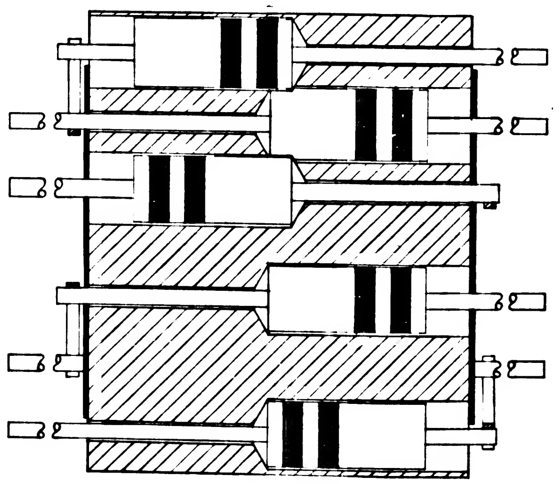


SECTION A-A

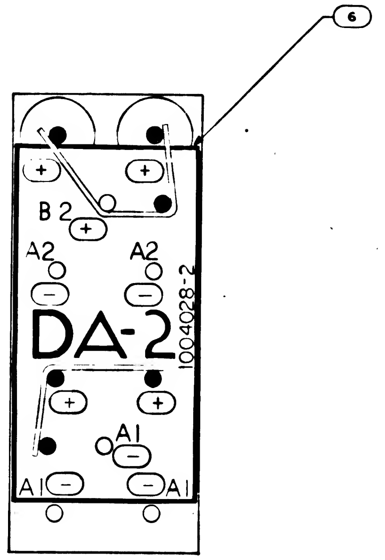


TOP & BOTTOM VIEW
WITH FILM & WIRING
SHOWN





SECTION B-B



THIS DRAWING
OBSOLETE
DO NOT USE
SUPERSEDED BY
SUPERSEDED BY

REFERENCE :
1. TEST IN ACCORDANCE WITH TEST SPEC ATP 1003002
2 SCHEMATIC 1006002

NOTES :
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY M -D-70327
2. ALL WELDING PE D-1002005
3. ● DENOTES LEADS TO BE CUT AFTER WELDING $\frac{1}{32}$ MAX ABOVE WELD

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004028-2	FILM, WIRING (BOTTOM)	6
1	1004028-1	FILM, WIRING (TOP)	5
AR	1006758-2	WIRE, ELECTRICAL, ROUND	4
AR	1006757	WIRE, ELECTRICAL (.010 x .020)	3
10	1006751	DIODE, SILICON, LOGIC	2
1	1004022-1	MODULE, INJECTION MOULDIN	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003041	
1003040	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT
DRAWN DEMPSKI DATE 8-9-62
CHECKED
APPROVAL 8/9/62
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

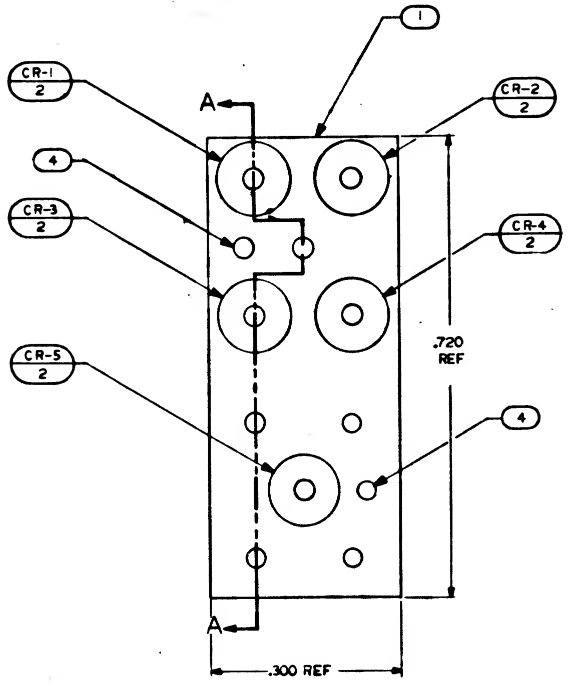
MODULE ASSEMBLY
"DA" CIRCUIT

CODE IDENT NO. SIZE E NASA DRAWING NO. 1003002
SCALE 10:1 WT SHEET 1 OF 1

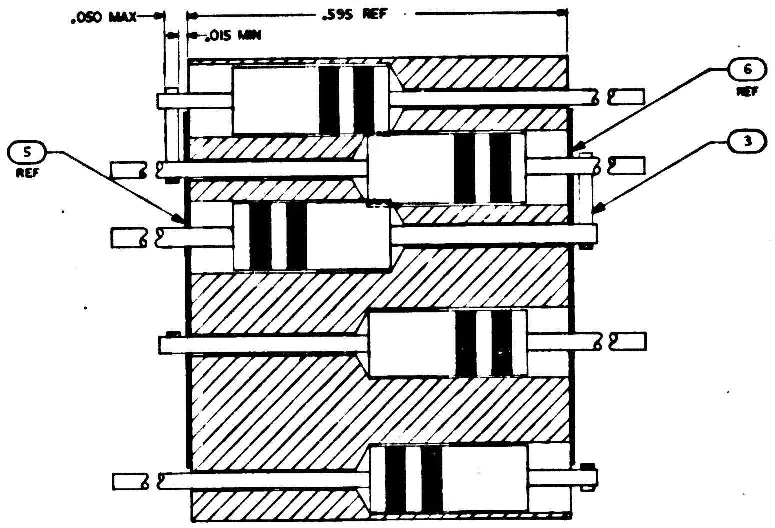
1003002 B

NOTICE — WHEN GOVERNMENT DRAWINGS SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED FURNISHED OR IN ANY WAY SUPPLIED THE SAID DRAWINGS SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE USE OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

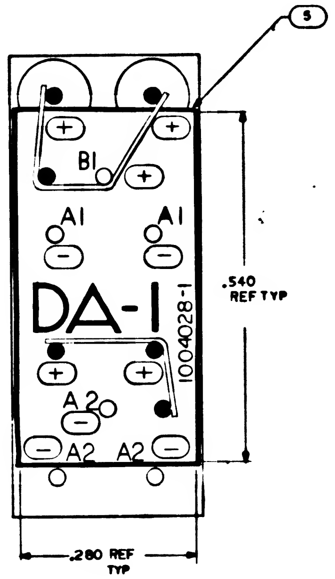
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	NOTES ADDED	8-16-62	



FILMS AND WIRING REMOVED FOR CLARITY



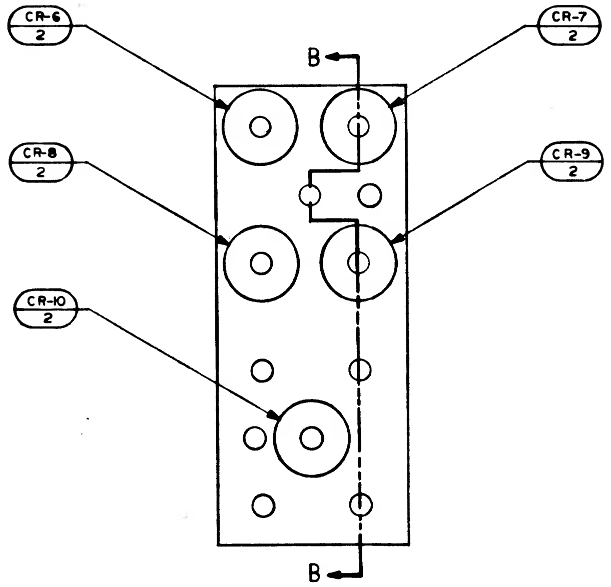
SECTION A-A

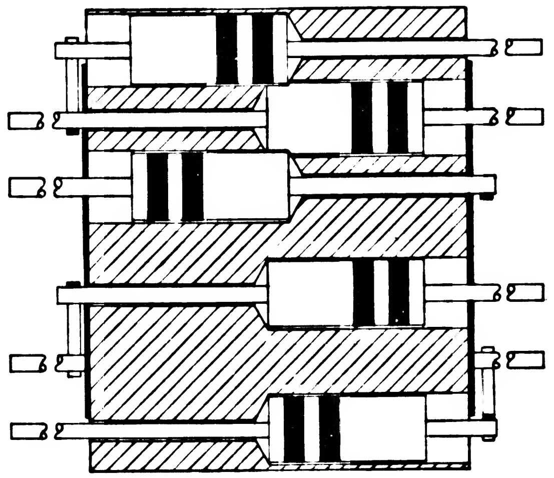


TOP & BOTTOM VIEW WITH FILM & WIRING SHOWN

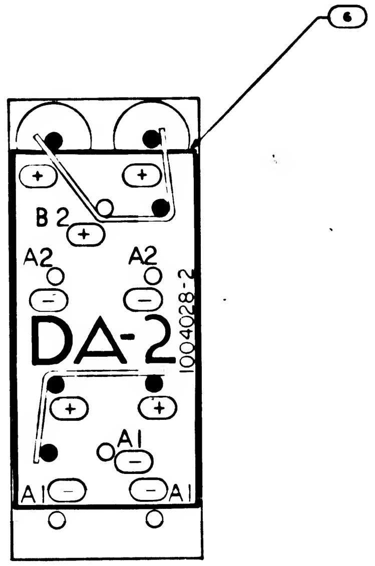
FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00004 DATE 8-9-62





SECTION B-B



REFERENCE:
1. TEST IN ACCORDANCE WITH TEST SPEC ATP 1003002
2 SCHEMATIC 1006002

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ALL WELDING PER ND-1002005
3. ● DENOTES LEADS TO BE CUT AFTER WELDING $\frac{1}{32}$ MAX ABOVE WELD

LIST OF MATERIALS

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004028-2	FILM, WIRING (BOTTOM)	6
1	1004028-1	FILM, WIRING (TOP)	5
AR	1006758-2	WIRE, ELECTRICAL, ROUND	4
AR	1006757	WIRE, ELECTRICAL (.010 x .020)	3
10	1006751	DIODE, SILICON, LOGIC	2
1	1004022-1	MODULE, INJECTION MOULDING	1

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

M I T
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO
CONTRACT

DRAWN DEMPSKI DATE 8-9-62
CHECKED
APPROVAL 8/16
APPROVAL
NASA APPROVAL Jack Barnard
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MODULE ASSEMBLY
DA CIRCUIT

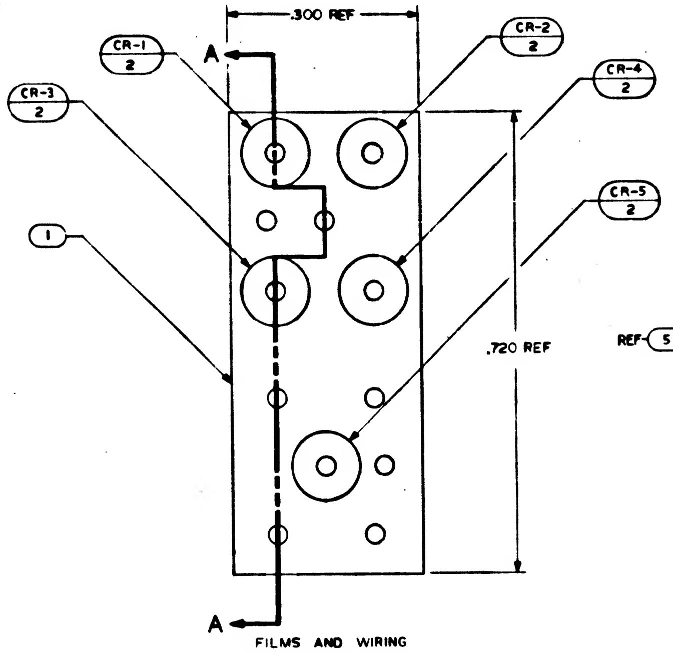
CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003002
SCALE 10:1
WT
SHEET OF

1003002 A

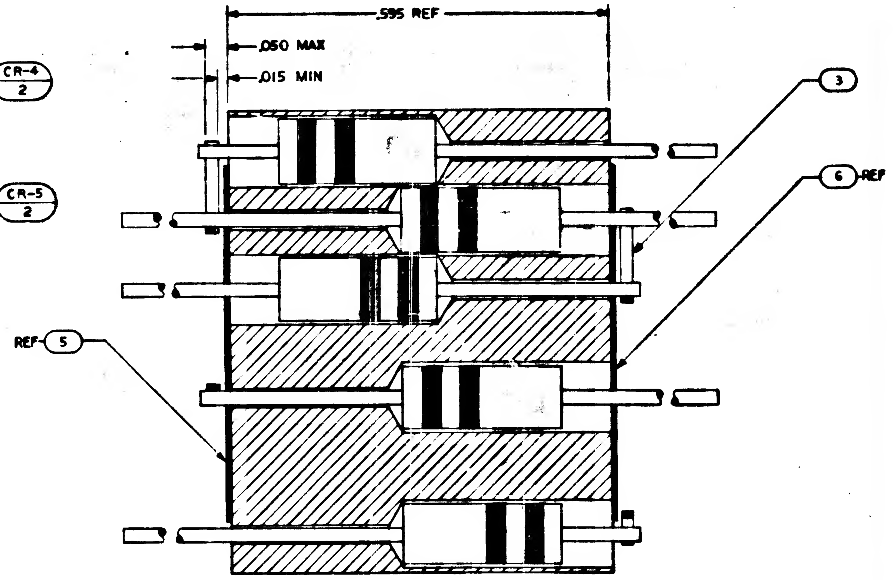
NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS

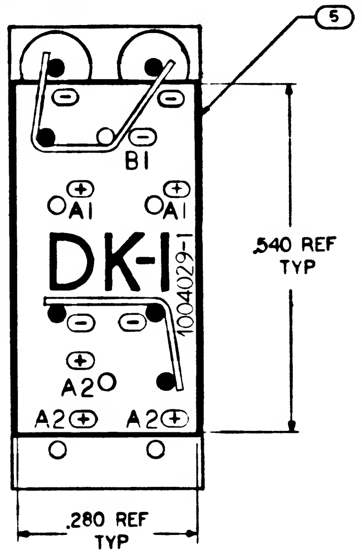
SYM	DESCRIPTION	DATE	APPROVAL
A	NOTES ADDED	8-16-62	



FILMS AND WIRING
REMOVED FOR CLARITY



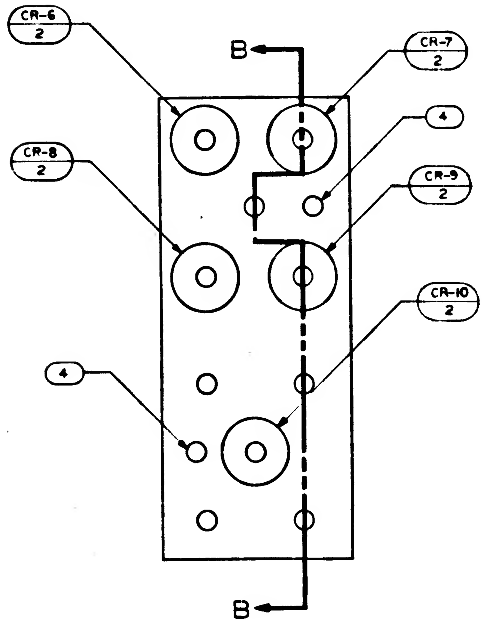
SECTION A-A

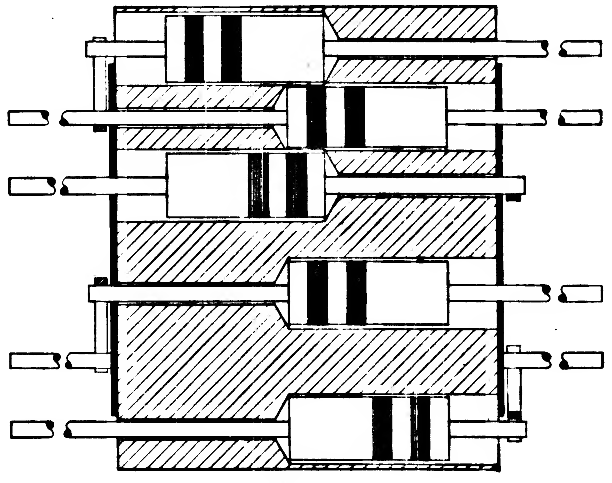


TOP & BOTTOM VIEW WITH
FILMS & WIRING SHOWN

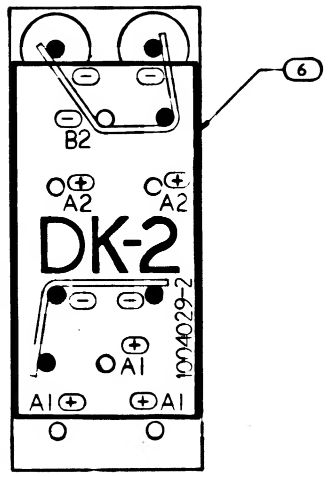
FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00004 DATE 8-9-62





SECTION B-B



REFERENCE :1. TEST IN ACCORDANCE WITH TEST SPEC ATP 1003003
2. SCHEMATIC 1006003

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ALL WELDING PER ND-1002005
3. ● DENOTES LEADS TO BE CUT AFTER WELDING $\frac{1}{32}$ MAX ABOVE WELD

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004029-2	FILM, WIRING (BOTTOM)	6
1	1004029-1	FILM, WIRING (TOP)	5
AR	1006758-2	WIRE ELECTRICAL, ROUND	4
AR	1006757	WIRE ELECTRICAL (.010 X .020)	3
10	1006751	DIODE, SILICON, LOGIC	2
1	1004022-2	MODULE, INJECTION MOULDING	

LIST OF MATERIALS

1003003 A

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

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INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO. CONTRACT
DRAWN L SHULMAN DATE 8-9-62
CHECKED Joe Morton
APPROVAL WRT 8/9/62
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

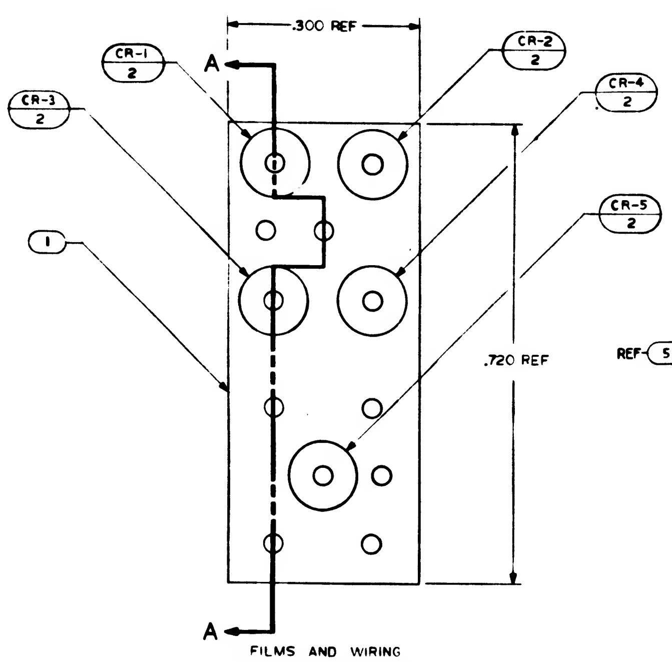
MODULE ASSEMBLY
DK CIRCUIT

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003003
SCALE 10:1
WT
SHEET OF

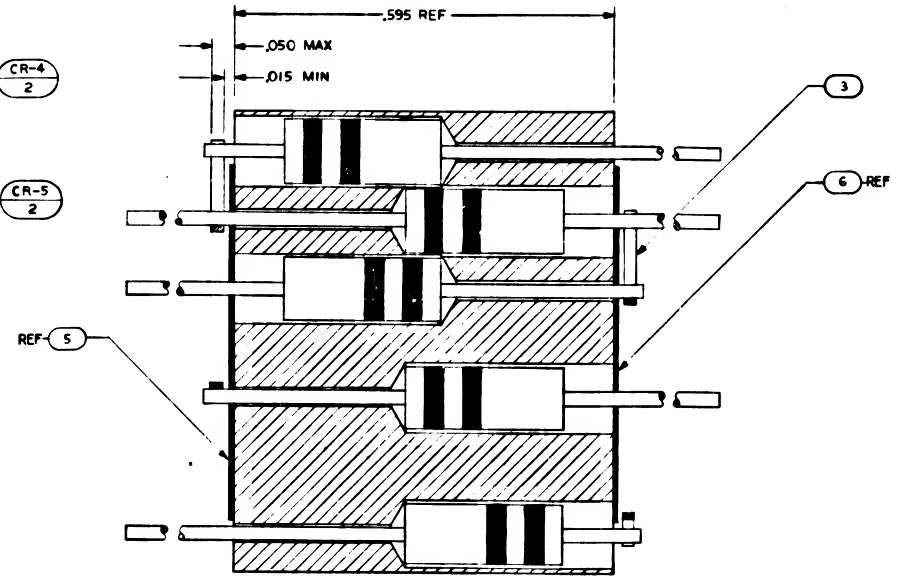
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	NOTES ADDED	8-16-62	
B	ADDED NEXT ASSY NO.	9-5-62	
	OBSOLETE PER TDRR 00143	10-18-62	WR

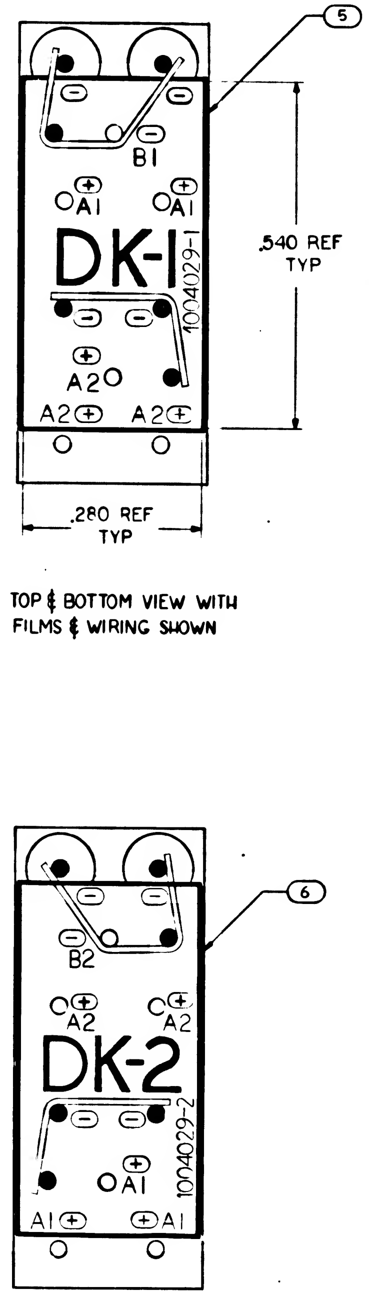
14/22/62



FILMS AND WIRING
REMOVED FOR CLARITY



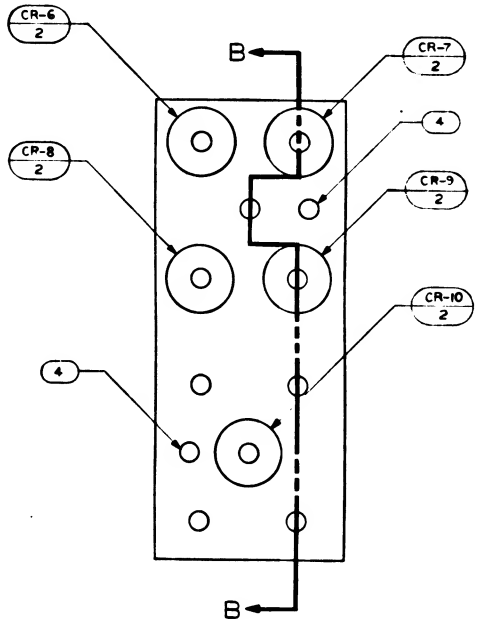
SECTION A-A

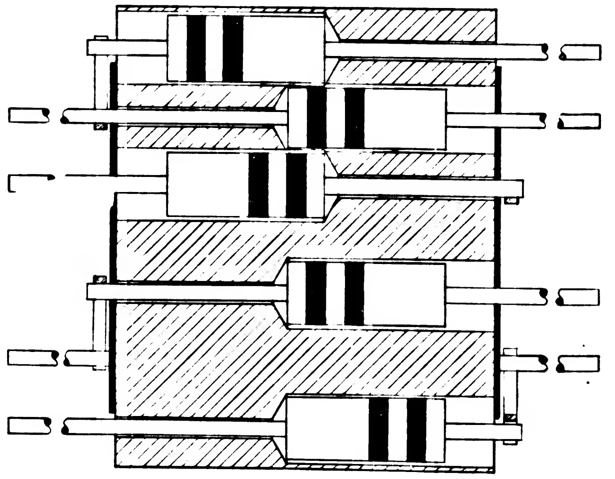


TOP & BOTTOM VIEW WITH
FILMS & WIRING SHOWN

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00004 DATE 8-9-62





SECTION B-B

THIS DRAWING
OBSOLETE
DO NOT USE
SUPERSEDED BY

REFERENCE :1. TEST IN ACCORDANCE WITH TEST SPEC ATP 1003003
2. SCHEMATIC 1006003

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ALL WELDING PER ND-1002005
3. ● DENOTES LEADS TO BE CUT AFTER WELDING $\frac{1}{32}$ MAX ABOVE WELD

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004029-2	FILM, WIRING (BOTTOM)	6
1	1004029-1	FILM, WIRING (TOP)	5
AR	1006758-2	WIRE ELECTRICAL, ROUND	4
AR	1006757	WIRE ELECTRICAL (.010 X .020)	3
10	1006751	DIODE, SILICON, LOGIC	2
1	1004022-2	MODULE, INJECTION MOLDING	1

LIST OF MATERIALS

1003041	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
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FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
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DRAWN L SHULMAN DATE 8-9-62
CHECKED
APPROVAL 8/9/62
APPROVAL
NASA APPROVAL Jack Barnard
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

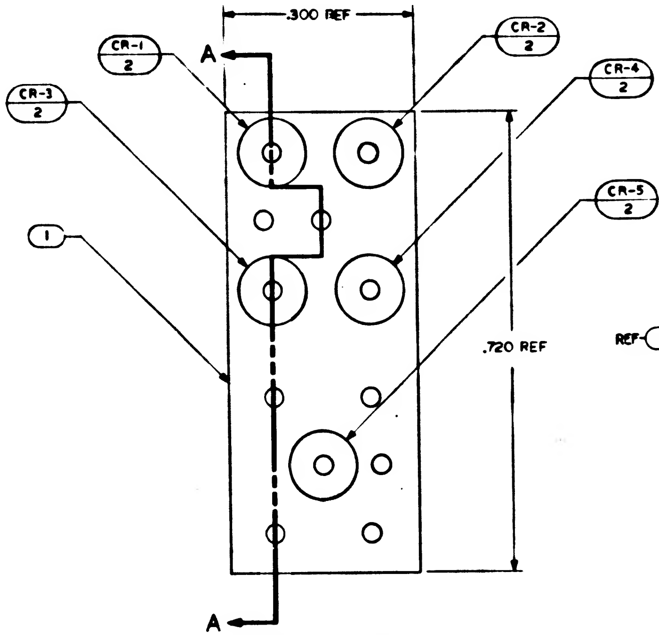
MODULE ASSEMBLY
"DK" CIRCUIT

CODE IDENT NO
SIZE E
NASA DRAWING NO 1003003
SCALE 10:1
WT
SHEET 1 OF 1

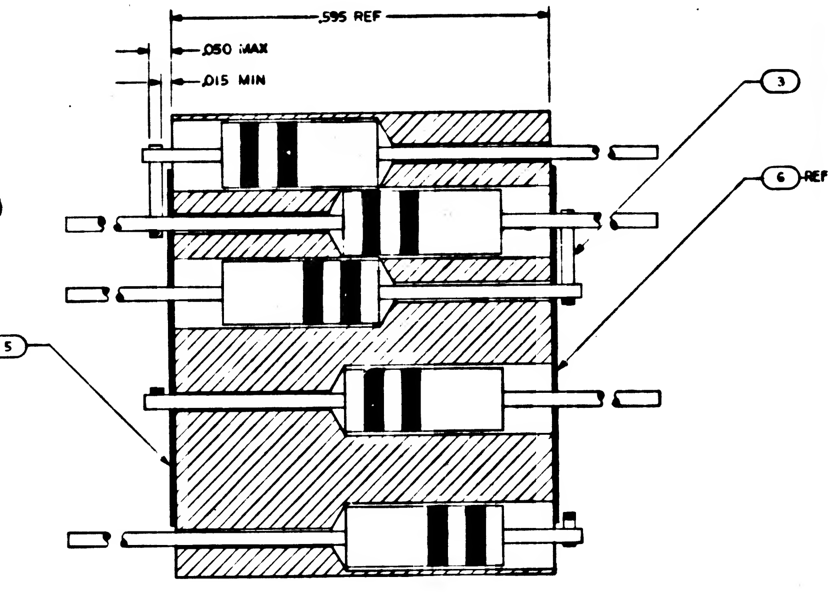
1003003 B

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

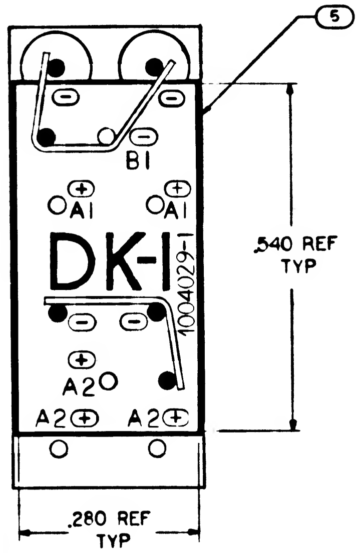
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	NOTES ADDED	8-16-62	



FILMS AND WIRING
REMOVED FOR CLARITY



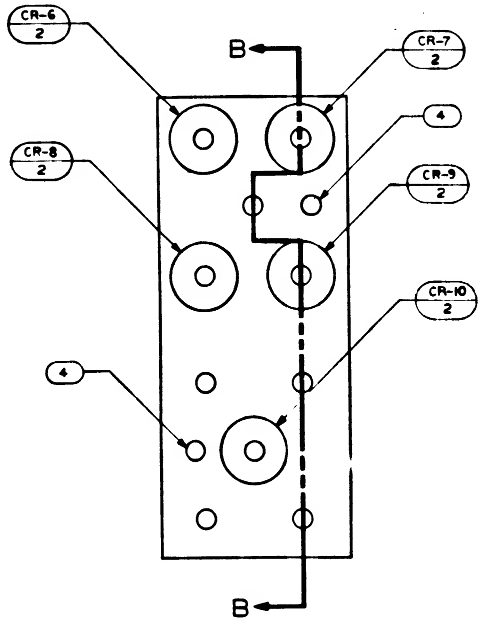
SECTION A-A

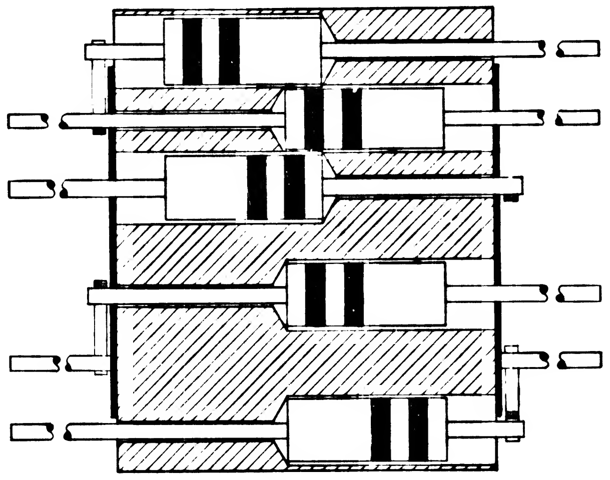


TOP & BOTTOM VIEW WITH
FILMS & WIRING SHOWN

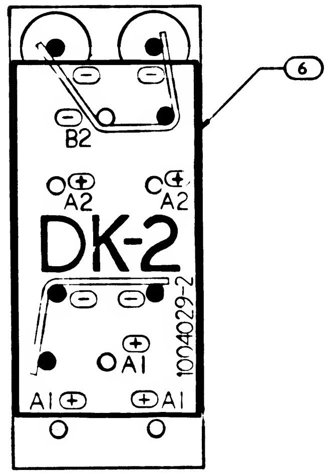
FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00004 DATE 8-9-62





SECTION B-B



REFERENCE :1. TEST IN ACCORDANCE WITH TEST SPEC ATP 1003003
2. SCHEMATIC 1006003

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-7 327
2. ALL WELDING PER ND-1002005
3. ● DENOTES LEADS TO BE CUT AFTER WELDING $\frac{1}{2}$ MAX ABOVE WELD

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004029-2	FILM, WIRING (BOTTOM)	6
1	1004029-1	FILM, WIRING (TOP)	5
AR	1006758-2	WIRE ELECTRICAL, ROUND	4
AR	1006757	WIRE ELECTRICAL (.010 X .020)	3
10	1006751	DIODE, SILICON, LOGIC	2
1	1004022-2	MODULE, INJECTION MOULDING	

LIST OF MATERIALS

NEXT ASSY	USED ON	
APPLICATION		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

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CAMBRIDGE MASS
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DRAWN L SHULMAN DATE 8-9-62
CHECKED
APPROVAL 8/9/62
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MODULE ASSEMBLY
DK CIRCUIT

CODE IDENT NO	SIZE	NASA DRAWING NO.
	E	1003003
SCALE 10:1	WT	SHEET OF

1003003 A

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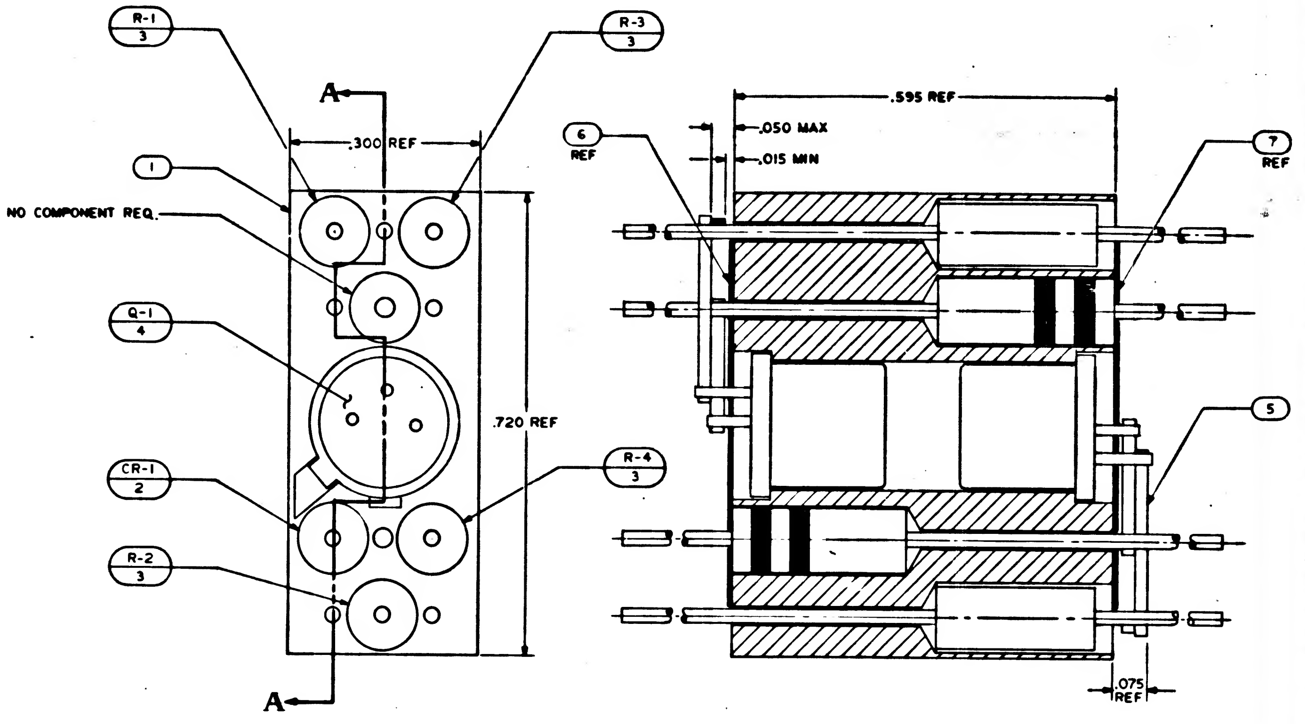
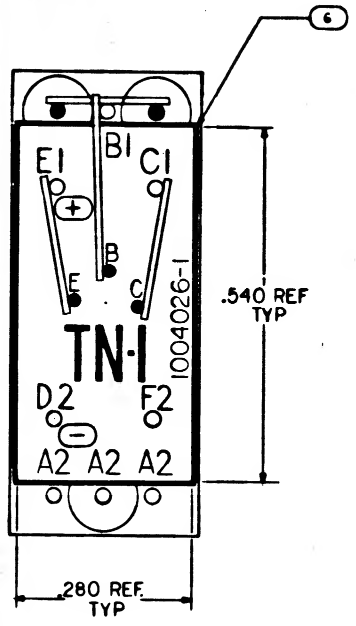
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	ADDED NOTES	8-16-62	

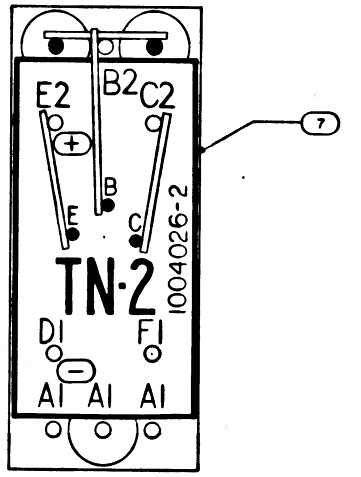


FILMS AND WIRING REMOVED FOR CLARITY

SECTION A-A

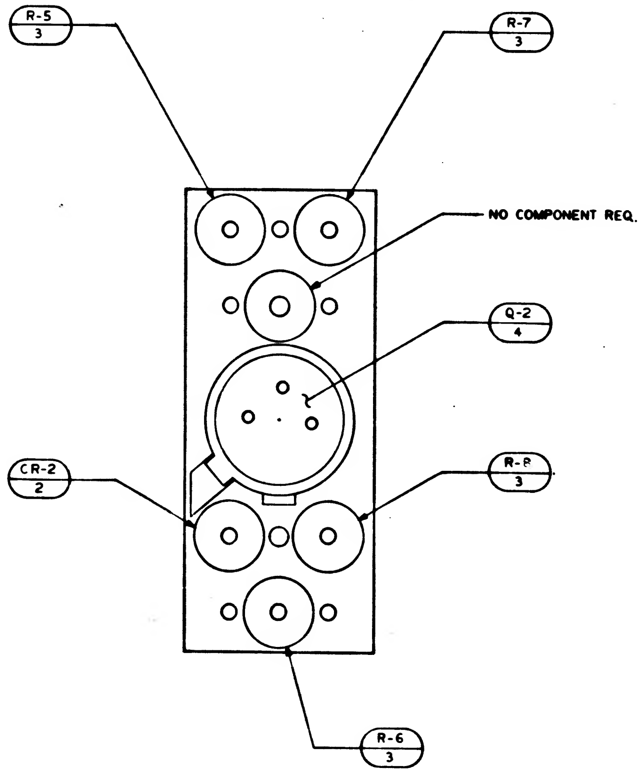


TOP & BOTTOM VIEWS WITH FILM & WIRING SHOWN



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00004 DATE 8-9-62



REFERENCE:
1 TEST IN ACCORDANCE WITH TEST SPEC ATP 1003004
2. SCHEMATIC 1006004

NOTES:
1 INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2 ALL WELDING PER ND 1002005
3. ● DENOTES LEADS TO BE CUT AFTER WELDING 1/32 MAX ABOVE WELD

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004026-2	FILM, WIRING (BOTTOM)	7
1	1004026-1	FILM, WIRING (TOP)	6
AR	1006757	WIRE, ELECTRICAL (010 X 020)	5
2	1006752	TRANSISTOR, NPN, LOGIC	4
8	1006750-56	RESISTOR, 2K 1/4 WATT 5%	3
2	1006751	DIODE, SILICON, LOGIC	2
1	1004017-2	MODULE, INJECTION MOULDING	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

M I T
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT
DRAWN BONARRIGO DATE 8-6-62
CHECKED Lee Martin
APPROVAL W B Tuscan 8/7/62
APPROVAL
NASA APPROVAL Jack Barnard
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MODULE ASSEMBLY
TN CIRCUIT

CODE IDENT NO.
SIZE E
NASA DRAWING NO 1003004
SCALE 10/1 WT SHEET OF

1003004 A

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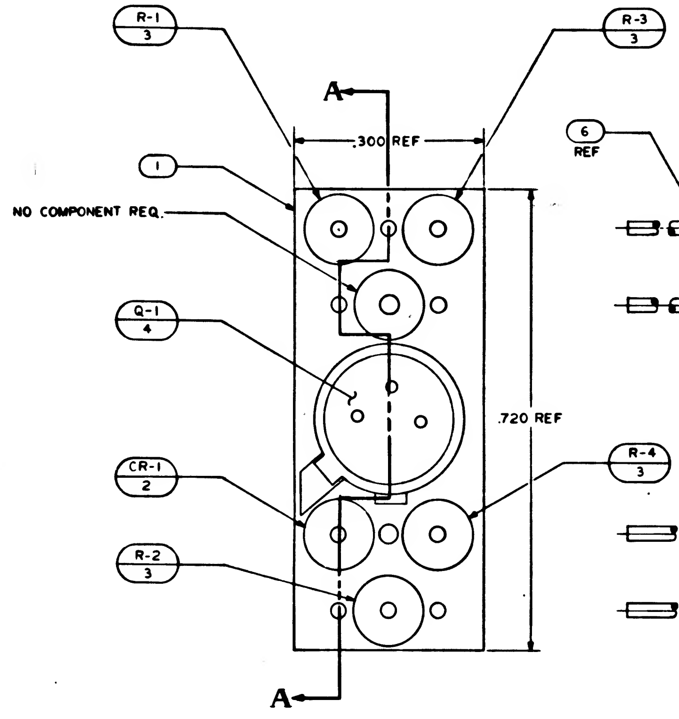
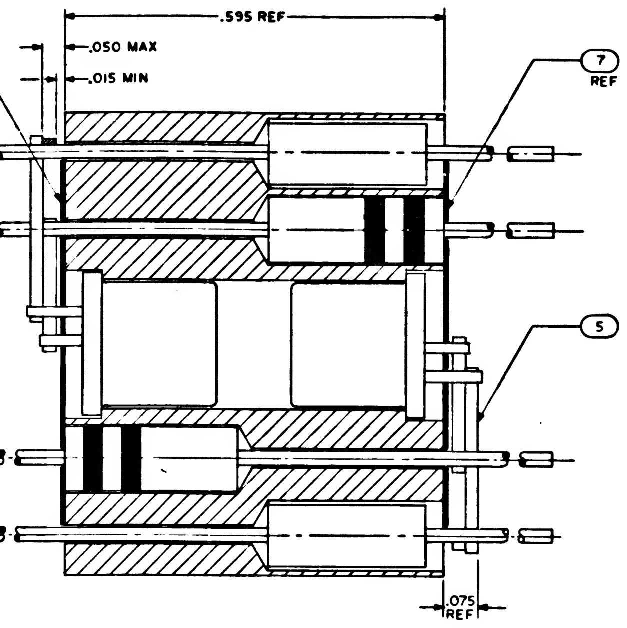
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	ADDED NOTES	8-16-62	
B	ADDED NEXT ASSEMBLY NO'S	9-6-62	
	OBSOLETE PER TDRR 00143	12-18-62	W.C.

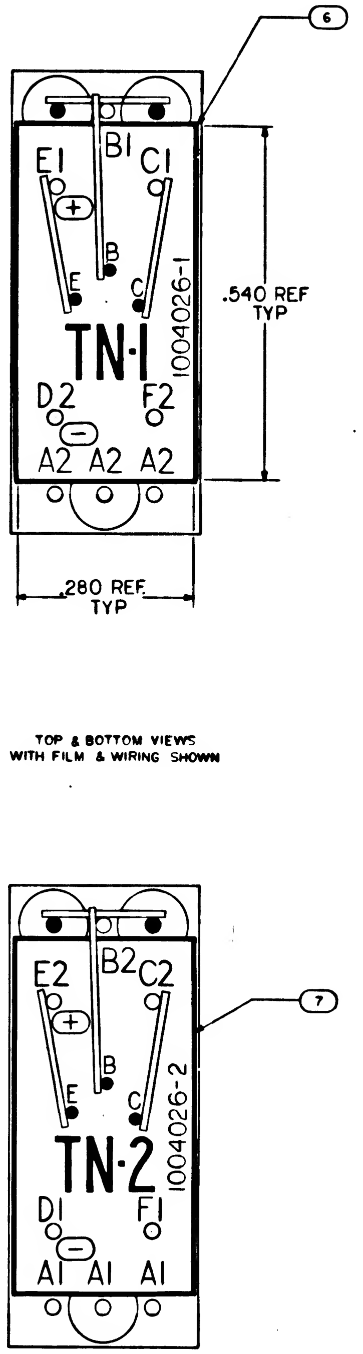
12/24/62



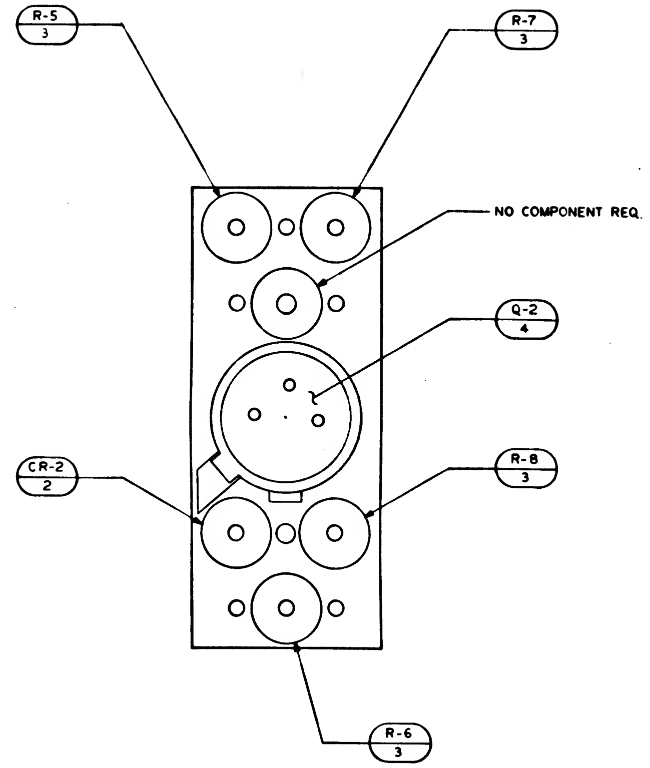
FILMS AND WIRING REMOVED FOR CLARITY



SECTION A-A



TOP & BOTTOM VIEWS WITH FILM & WIRING SHOWN



FOR INFORMATION ONLY
CLASS B RELEASE TDR No. 00004 DATE 8-9-62

THIS DRAWING
OBSOLETE
DO NOT USE
SUPERSEDED BY ____________

REFERENCE:
1 TEST IN ACCORDANCE WITH TEST SPEC ATP 1003004
2. SCHEMATIC 1006004

NOTES:
1 INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2 ALL WELDING PER ND 1002005
3 ● DENOTES LEADS TO BE CUT AFTER WELDING 1/32 MAX ABOVE WELD

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004026-2	FILM, WIRING (BOTTOM)	7
1	1004026-1	FILM, WIRING (TOP)	6
AR	1006757	WIRE, ELECTRICAL (010 X 020)	5
2	1006752	TRANSISTOR, NPN, LOGIC	4
8	1006750-56	RESISTOR, 2K 1/4 WATT 5%	3
2	1006751	DIODE, SILICON, LOGIC	2
1	1004017-2	MODULE, INJECTION MOULDING	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003041	
1003040	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

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DWG ON CONTRACT
DRAWN BONARRIGO DATE 8-6-62
CHECKED Lee Martin
APPROVAL W B Turner 8/7/62
APPROVAL 8/7/62
NASA APPROVAL Jack Bramar
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

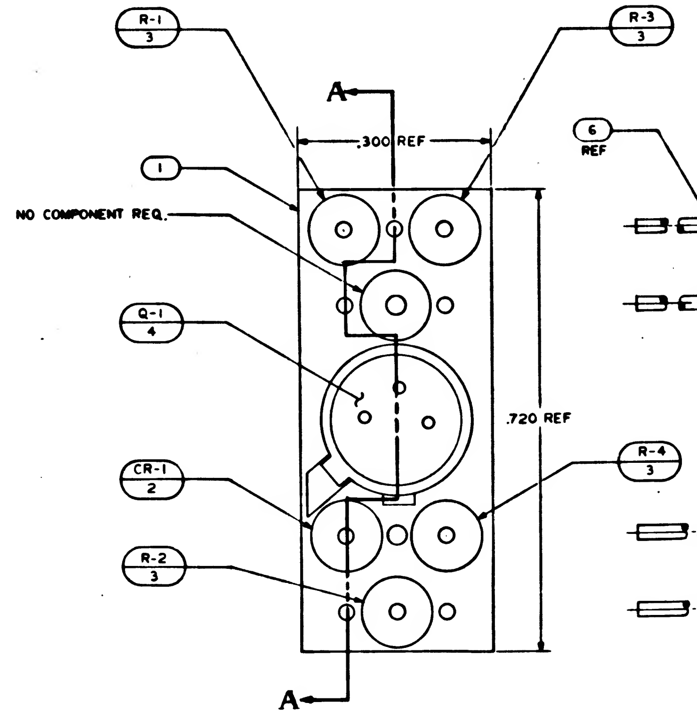
MODULE ASSEMBLY
"TN" CIRCUIT

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003004
SCALE 10/1
WT
SHEET 1 OF 1

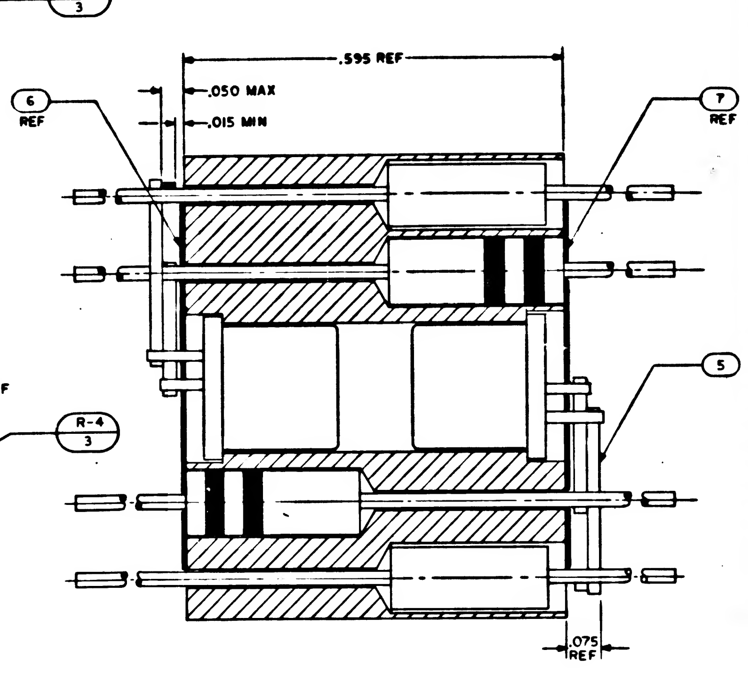
1003004 B

NOTICE – WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

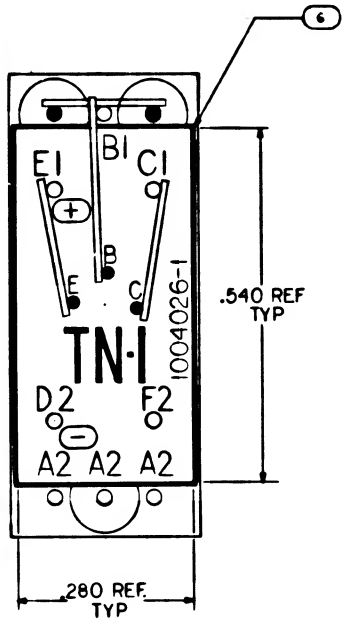
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	ADDED NOTES	8-16-62	



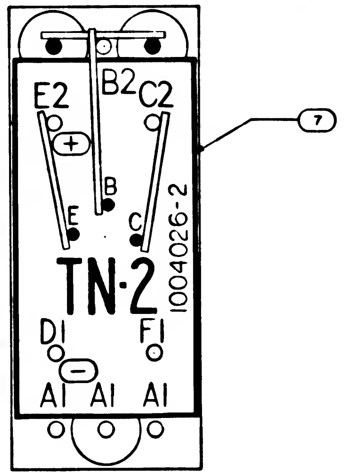
FILMS AND WIRING
REMOVED FOR CLARITY

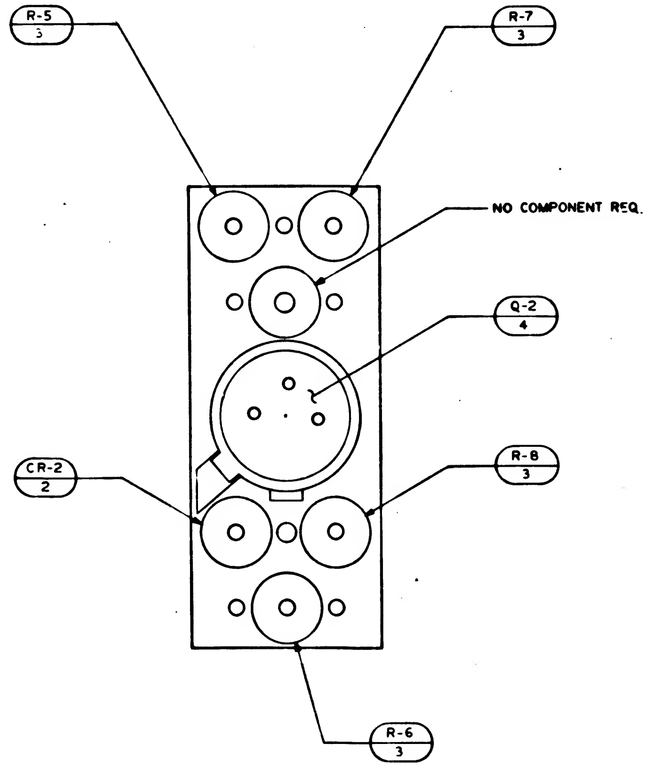


SECTION A-A



TOP & BOTTOM VIEWS
WITH FILM & WIRING SHOWN





FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 0000 4 DATE 8-9-62

REFERENCE:
1 TEST IN ACCORDANCE WITH TEST SPEC ATP 1003004
2 SCHEMATIC 1006004

NOTES:
1 INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2 ALL WELDING PER NO 1002005
3 ● DENOTES LEADS TO BE CUT AFTER WELDING 1/32 MAX ABOVE WELD

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004026-2	FILM, WIRING (BOTTOM)	7
1	1004026-1	FILM, WIRING (TOP)	6
AR	1006757	WIRE, ELECTRICAL (.010 X .020)	5
2	1006752	TRANSISTOR, NPN, LOGIC	4
8	1006750-56	RESISTOR, 2K 1/4 WATT 5%	3
2	1006751	DIODE, SILICON, LOGIC	2
1	1004017-2	MODULE, INJECTION MOULDING	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

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INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT

DRAWN BONARRIGO DATE 8-6-62
CHECKED
APPROVAL W. B. 8/7/62
APPROVAL 8/7/62
NASA APPROVAL Jack
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MODULE ASSEMBLY
TN CIRCUIT

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003004
SCALE 10/1
WT
SHEET OF

1003004 A

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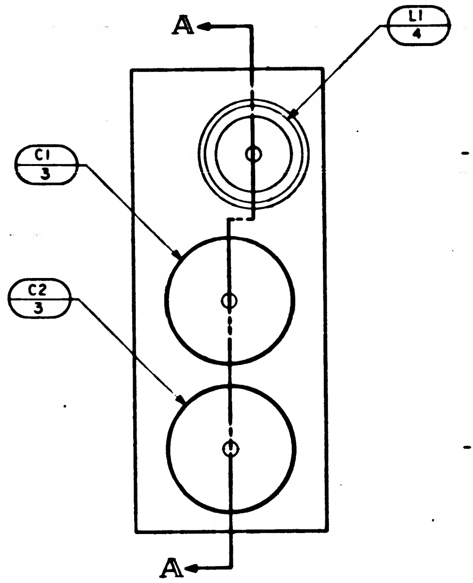
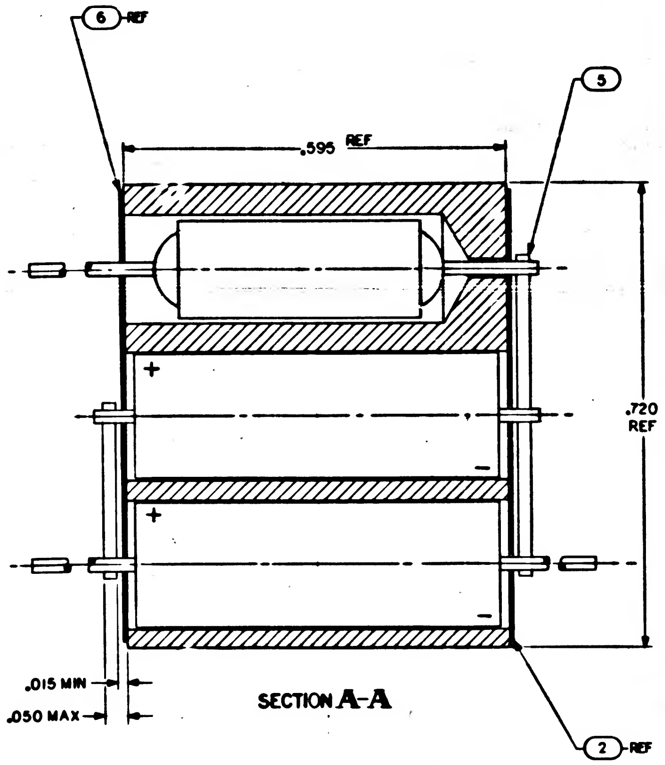
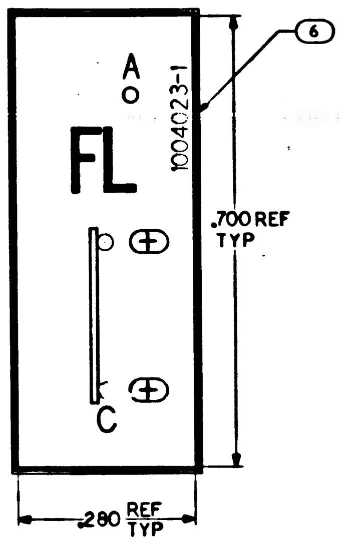
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	NOTES ADDED	8-16-62	

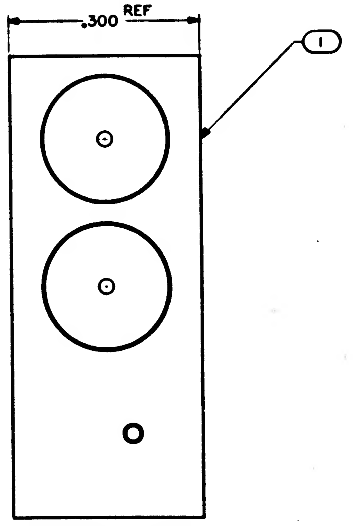




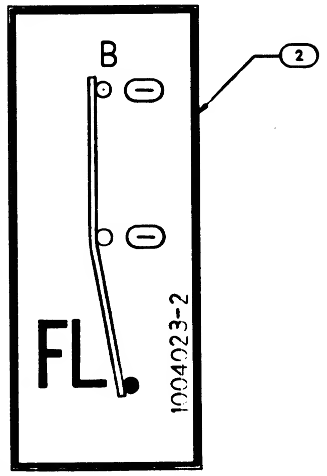
SECTION A-A



TOP & BOTTOM VIEW WITH FILMS & WIRING SHOWN



FILMS & WIRING REMOVED FOR CLARITY



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 0000 4 DATE 8-9-62

REFERENCES:-
1.TEST IN ACCORDANCE WITH TEST SPEC APT 1003005.
2.SCHEMATIC 1006005

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS. PRESCRIBED BY MIL-D-70327.
2. ALL WELDING PER ND 1002005.
3. ● DENOTES LEADS TO BE CUT AFTER WELDING 1/32 MAX ABOVE WELD.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004023-1	MYLAR FILM (TOP)	6
AR	1006757	WIRE.ELECTRICAL, .010 X .020	5
1	1006756-1	CHOKE.R.H. 100 UH	4
2	1006755-5	CAPACITOR, FIXED. Ta 6.8UFD 35VDC 20%	3
1	1004023-2	MYLAR FILM (BOTTOM)	2
1	1004021	MODULE INJECTION MOULDING	1

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO CONTRACT
DRAWN S.DELL'ANNO DATE 8-8-62
CHECKED
APPROVAL B. Turner 8/62
APPROVAL Duggan 8/62
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MODULE ASSEMBLY
"FL" FILTER CIRCUIT

CODE IDENT NO. SIZE E NASA DRAWING NO. 1003005
SCALE 10/1 WT SHEET OF

1003005 A

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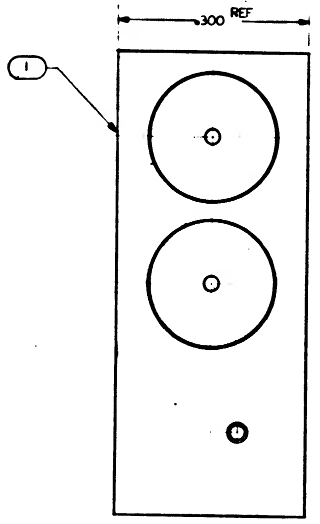
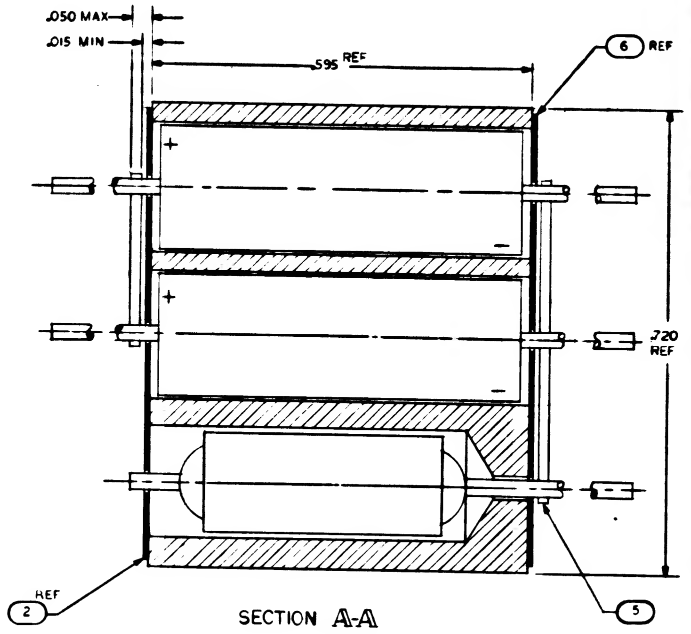
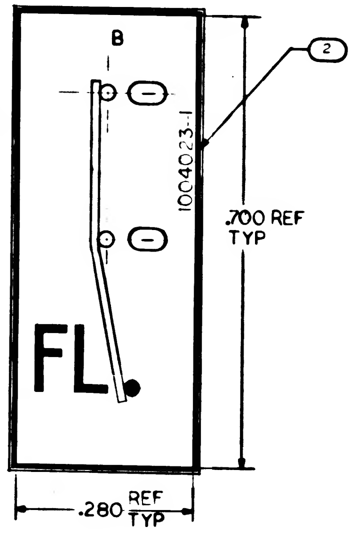
SYM	DESCRIPTION	DATE	APPROVAL
	REVISIONS		
A	NOTES ADDED	8-16-62	
B	REDRAWN & REVISED	8-28-62	



FILMS & WIRING REMOVED FOR CLARITY.



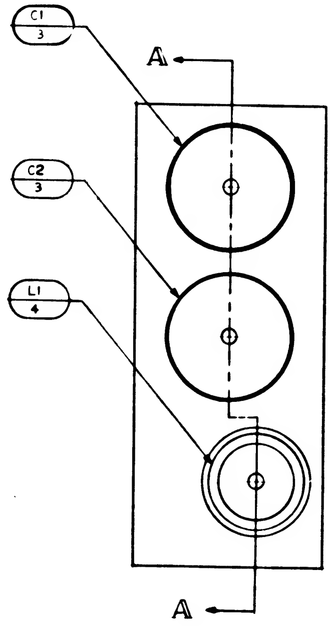
SECTION A-A

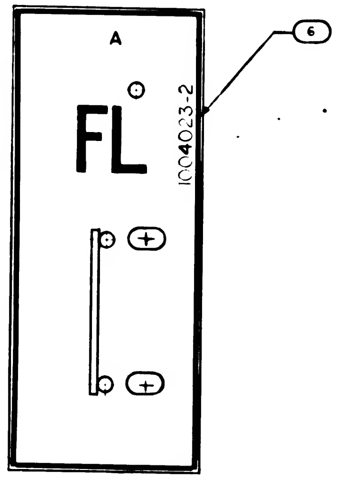


TOP & BOTTOM VIEW WITH FILMS & WIRING SHOWN

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00022 DATE 8-30-62





REFERENCES
1. TEST IN ACCORDANCE WITH TEST SPEC APT 1003005.
2. SCHEMATIC 1006005

NOTES:
1. INTERPRET DRAWING ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. ALL WELDING PER ND 1002005.
3. ● DENOTES LEADS TO BE CUT AFTER WELDING 1/32 MAX ABOVE WELD.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004023-2	MYLAR FILM (30""CM)	6
AR	1006757	WIRE, ELECTRICAL, .010 x.020	5
1	1006756-1	CHOKE R.H 100	4
2	1006755-5	CAPACITOR FIXED .8UFD 35VDC 20%	3
	1004023-1	MYLAR FILM (TOP)	2
	1004021	MODULE INJECTION MOULDING	1

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± —
DECIMALS ± —
ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

INCHES
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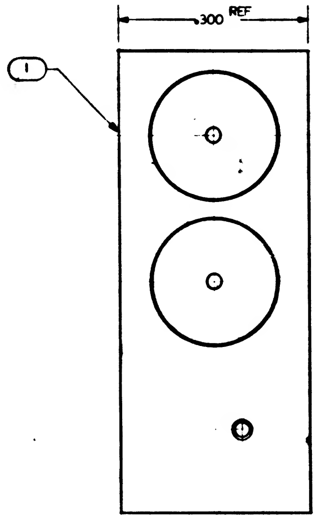
CAMBRIDGE, MASS.
DWG NO CONTRACT
DRAWN LOWE DATE 8-28-62
CHECKED Lee Martin
APPROVAL W.B. Turner
APPROVAL
NASA APPROVAL 8-30-62
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

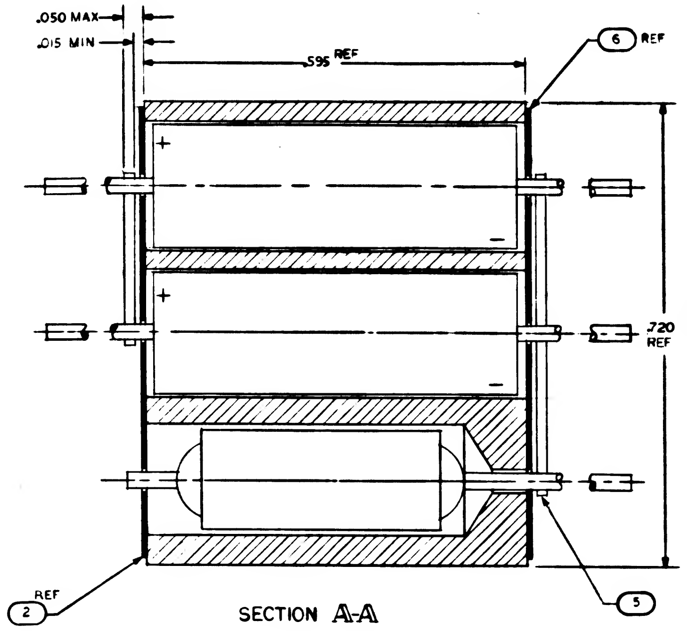
MODULE ASSEMBLY
"FL" FILTER CIRCUIT

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003005
SCALE 10/1 WT SHEET OF

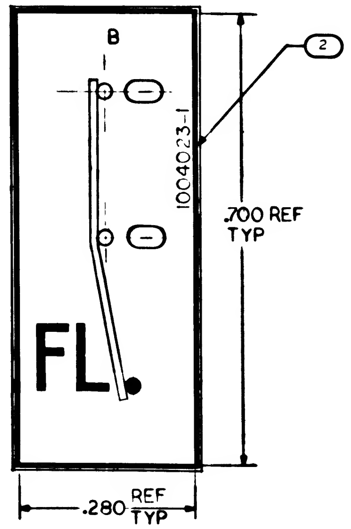
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	NOTES ADDED	8-16-62	
B	REDRAWN & REVISED	8-28-62	
C	ADDED NEXT ASS'Y NO.	9-5-62	
	OBSOLETE PER TDRR 00193	10-18-62	WR 12/10/62



FILMS & WIRING REMOVED FOR CLARITY.



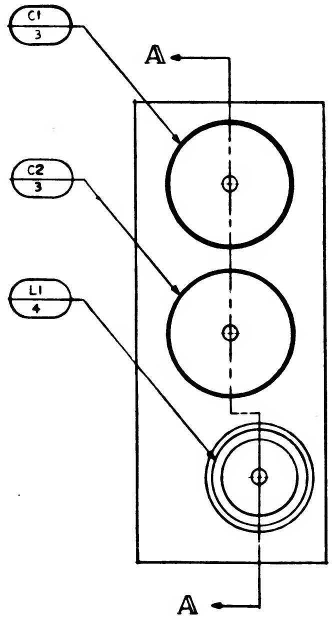
SECTION A-A

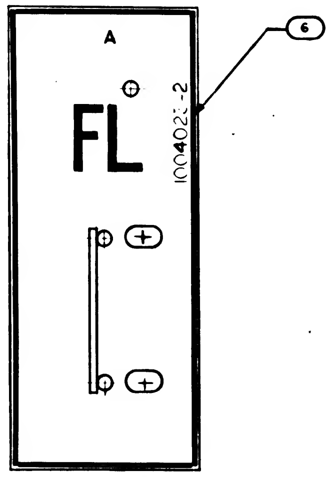


TOP & BOTTOM VIEW WITH FILMS & WIRING SHOWN

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00022 DATE 8-30-62





REFERENCES
1. TEST IN ACCORDANCE WITH TEST SPEC APT 1003005.
2. SCHEMATIC 1006005

NOTES:
1 INTERPRET DRAWING ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2 ALL WELDING PER ND 1002005.
3 ● DENOTES LEADS TO BE CUT AFTER WELDING 1/32 MAX ABOVE WELD.

THIS DRAWING
OBSOLETE
DO NOT USE
SUPERSEDED BY

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004023-2	MYLAR FILM (BOTTOM)	6
AR	1006757	WIRE, ELECTRICAL, .010 x.020	5
1	1006756-1	CHOKE R.H. 100UH	4
2	1006755-5	CAPACITOR FIXED .8UFD 35VDC 20%	3
	1004023-1	MYLAR FILM (TOP)	2
1	1004021	MODULE INJECTION MOULDING	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003041	
1003040	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

INCHES
PHOTOGRAPHIC SCALE ONLY

M I T
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO
CONTRACT
DRAWN E. LOWE DATE 8-28-62
CHECKED Lee Martin
APPROVAL
APPROVAL
NASA APPROVAL 8-30-62
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MODULE ASSEMBLY
"FL" FILTER CIRCUIT

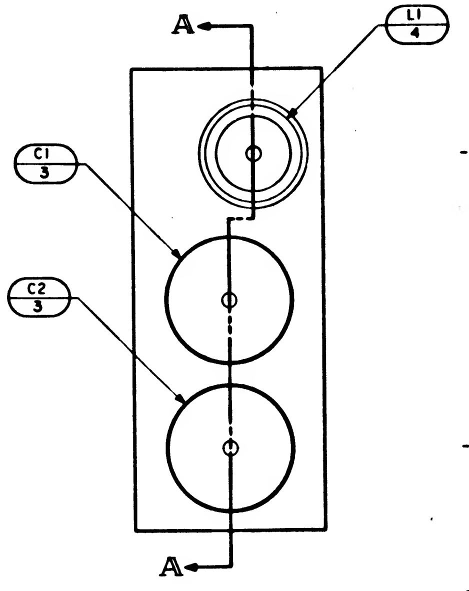
CODE IDENT NO
SIZE E
NASA DRAWING NO 1003005
SCALE 10/1
WT
SHEET 1 OF 1

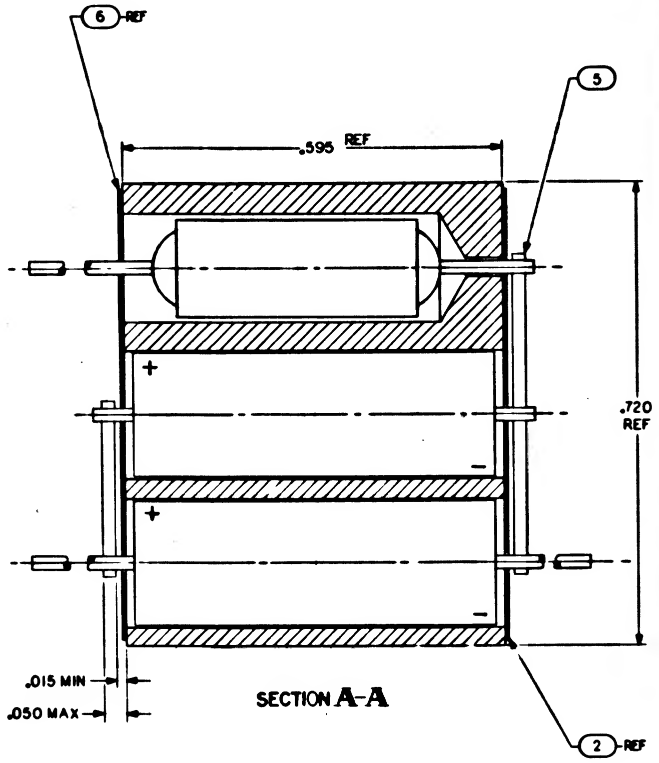
1003005

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

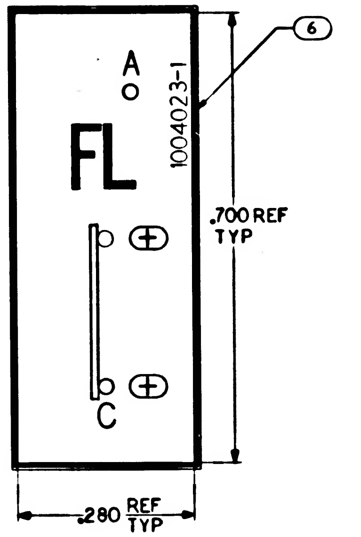
REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
A	NOTES ADDED	8-16-62	

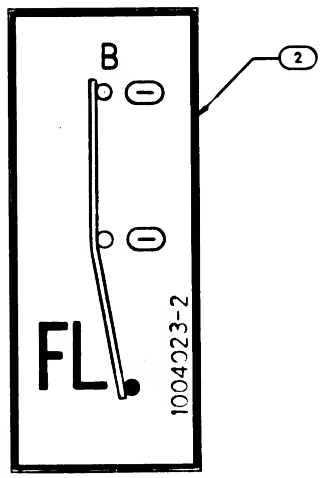


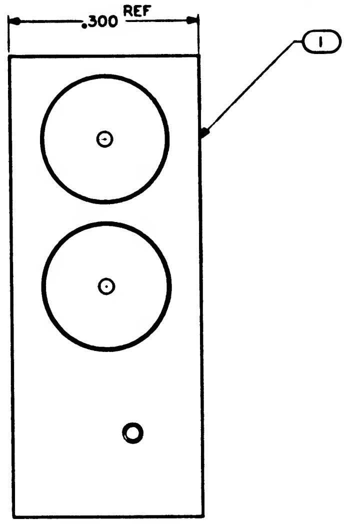


SECTION A-A



TOP & BOTTOM VIEW WITH FILMS & WIRING SHOWN





FILMS & WIRING REMOVED FOR CLARITY

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 0000 4 DATE 8-9-62

REFERENCES-
1. TEST IN ACCORDANCE WITH TEST SPEC APT 1003005.
2. SCHEMATIC 1006005

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS. PRESCRIBED BY MIL-D-70327.
2. ALL WELDING PER ND 1002005.
3. ● DENOTES LEADS TO BE CUT AFTER WELDING 1/32 MAX ABOVE WELD.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004023-1	MYLAR FILM (TOP)	6
AR	1006757	WIRE, ELECTRICAL, .010 X .020	5
1	1006756-1	CHOKE, R H. 100 UH	4
2	1006755-5	CAPACITOR, FIXED. Ta 6.8UFD 35VDC 20%	3
1	1004023-2	MYLAR FILM (BOTTOM)	2
1	1004021	MODULE INJECTION MOULDING	1

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

M I T
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO CONTRACT
DRAWN S. DELL'ANNO DATE 8-8-62
CHECKED
APPROVAL 8/9/62
APPROVAL 8/9/62
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MODULE ASSEMBLY
"FL" FILTER CIRCUIT

CODE IDENT NO.
SIZE E
NASA DRAWING NO 1003005
SCALE 10/1
WT
SHEET OF

1003005 A

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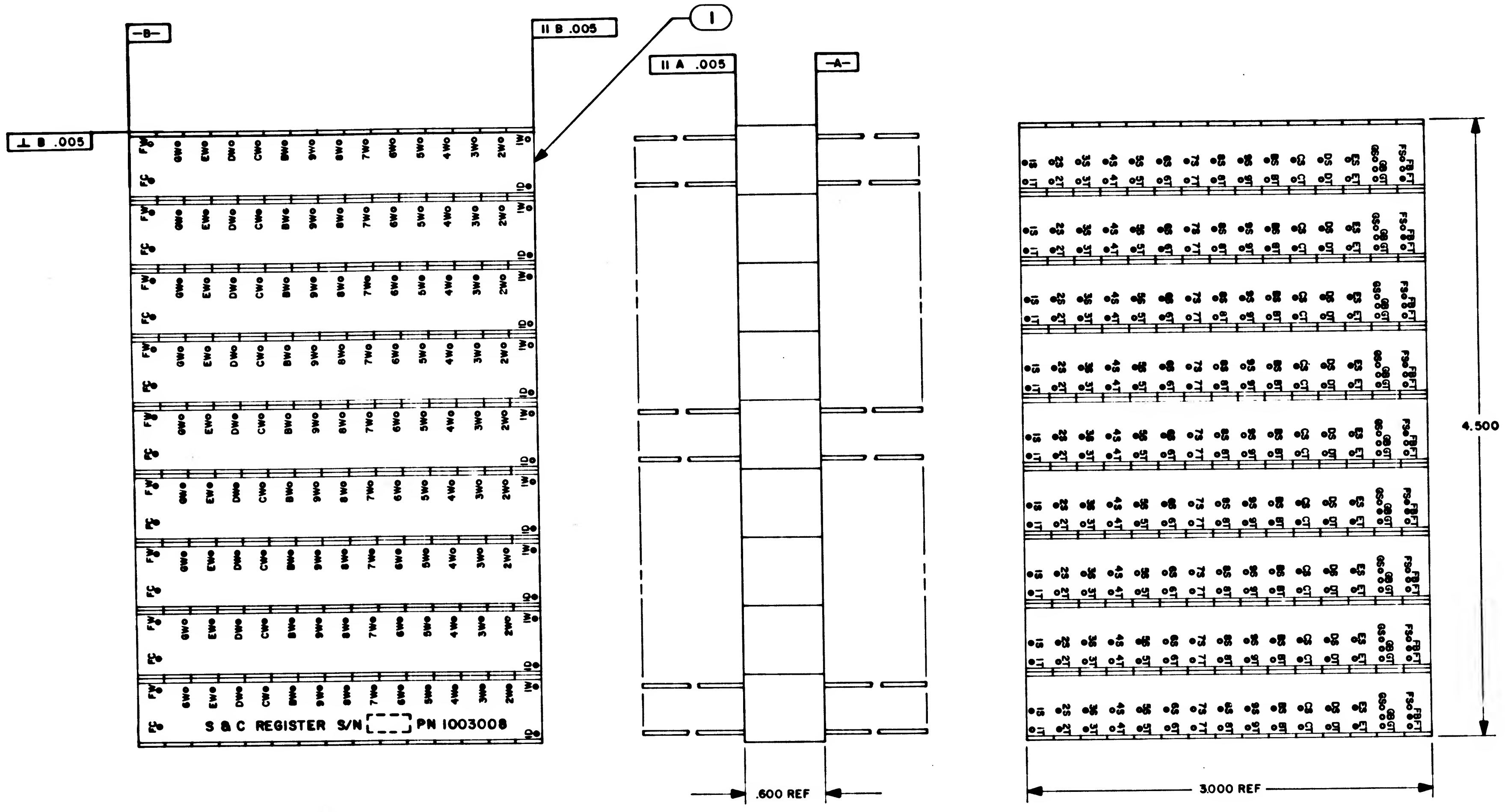
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
—	TAKEN FROM MIT D-88761	8-1-62	



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00020 DATE 8-23-62

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. BOND FIND NO. 1 AS SHOWN PER ND 1002004

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
9	1003008	S&C REGISTER STICK POTTED	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003023	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ±— DECIMALS ±.005 ANGLES ±—
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO. CONTRACT
DRAWN MAHONEY DATE 8-1-62
CHECKED
APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL 8/23/62

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

BANK ASSEMBLY
S & C REGISTER

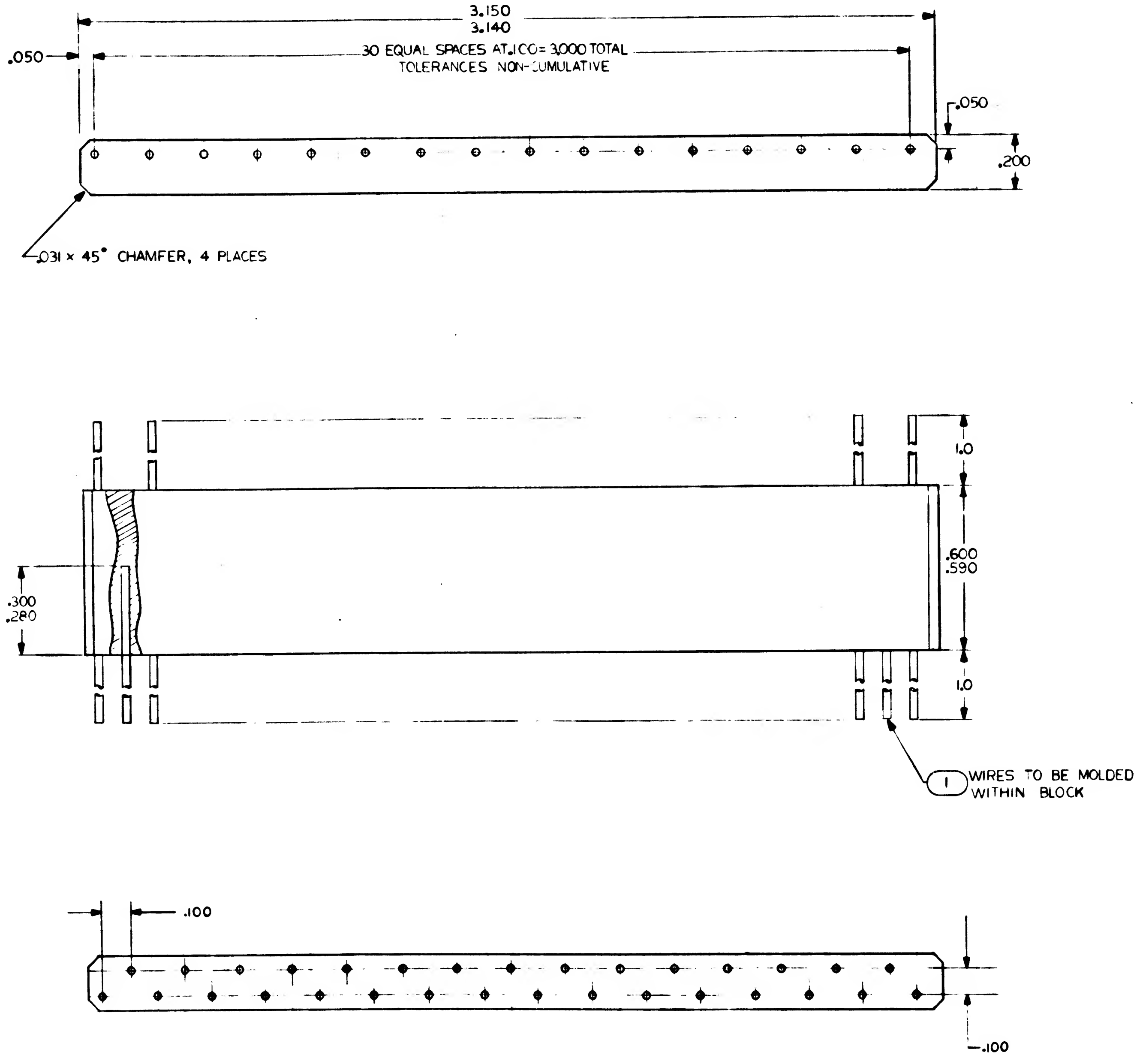
CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003011
SCALE 2/1
WT
SHEET 1 OF 1

1003011

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL


3.150
3.140
.050
30 EQUAL SPACES AT .100 = 3.000 TOTAL
TOLERANCES NON-CUMULATIVE
.050
.200
.031 × 45° CHAMFER, 4 PLACES
1.0
.600
.590
.300
.280
1.0
1 WIRES TO BE MOLDED WITHIN BLOCK
.100
.100

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00020 DATE 8-23-62

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. NYLON / MIL-P-20693 TYPE IV

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1006758-1	WIRE, ELECTRICAL (.025 DIAMETER)	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003023	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL SEE NOTE 2
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO CONTRACT
DRAWN J. S. Hart DATE 7-24-62
CHECKED
APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL W. Kupfer 8/23/62

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

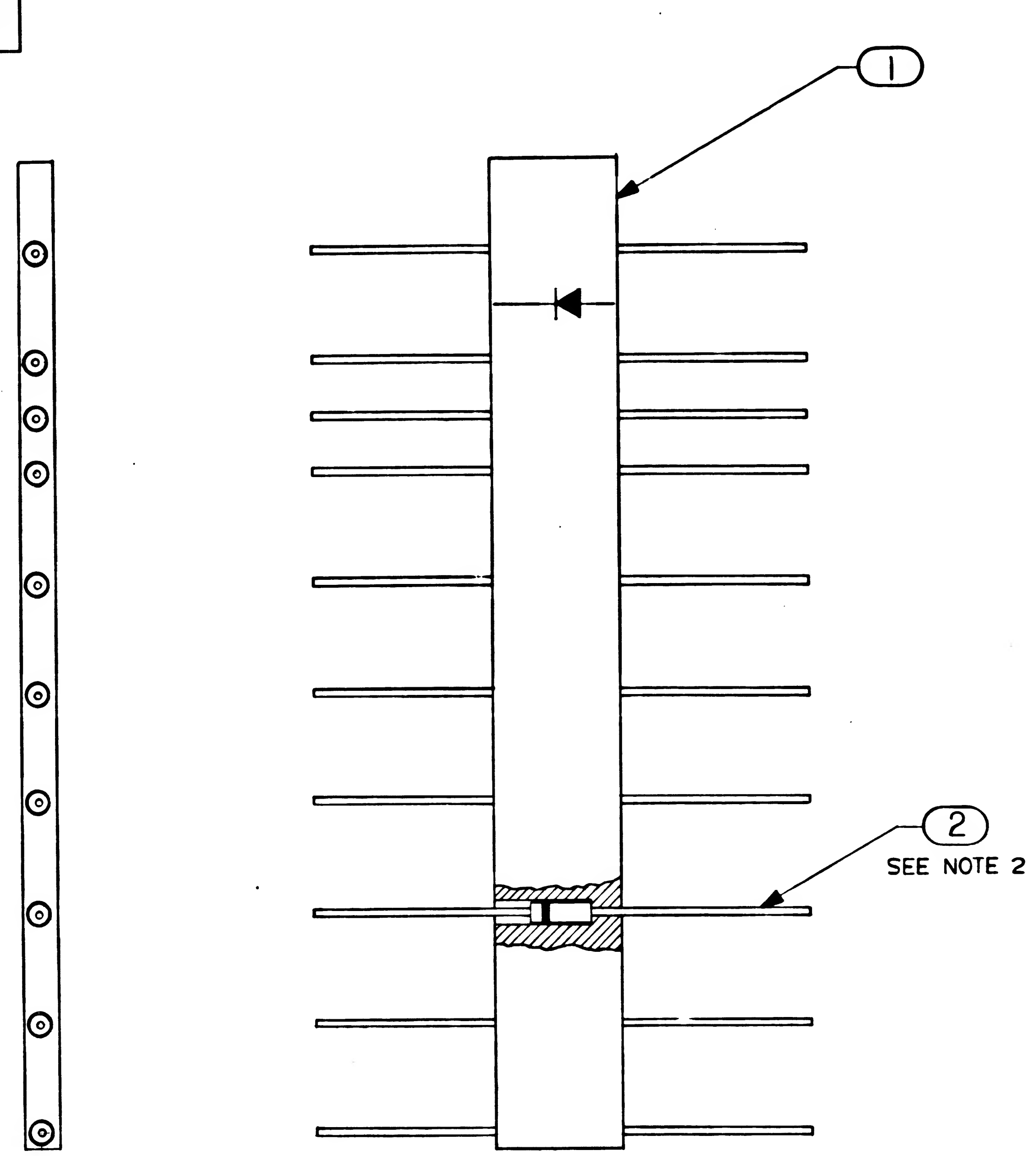
BLOCK, PIN
S&C REGISTER

CODE IDENT NO. SIZE D NASA DRAWING NO. 1003019
SCALE 4:1 WT SHEET OF

1003019

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00020 DATE 8-23-62

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. BOND FIND NO 2 TO FIND NO 1 PER ND. 1002009

10	1006751	DIODE, SILICON	2
1	1004005	DIODE BLOCK	1
QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

1003023	
NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT

DRAWN DEMPSKI DATE 7-23-62
CHECKED Joe Martin
APPROVAL W B Turner
APPROVAL
NASA APPROVAL
MIT APPROVAL 8/23/62

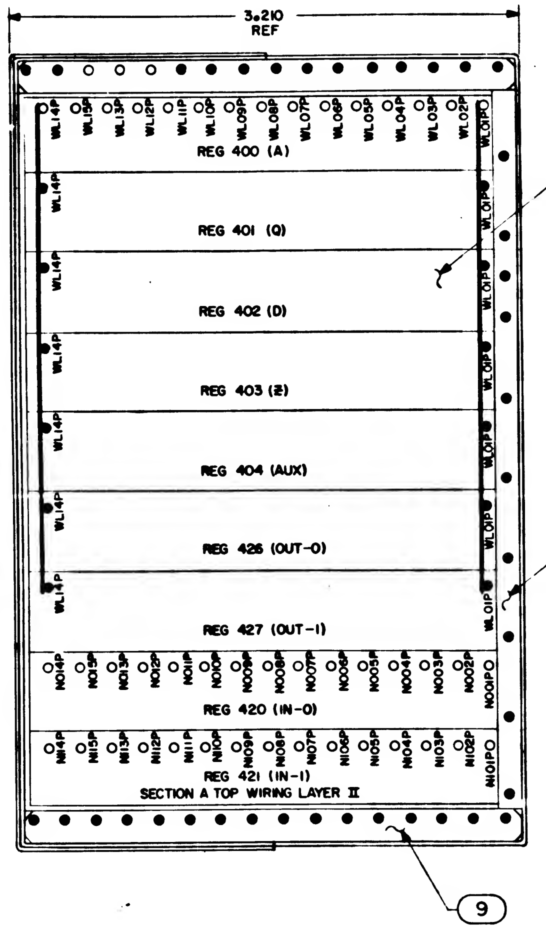
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

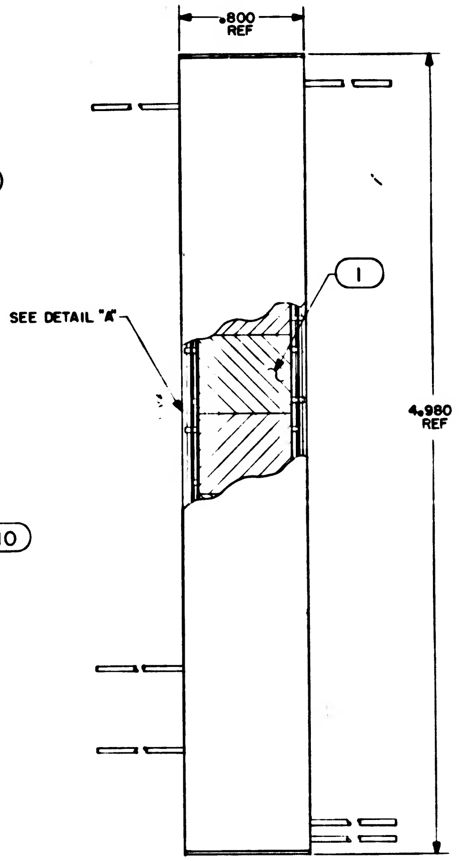
DIODE BLOCK ASSEMBLY
S&C REGISTER

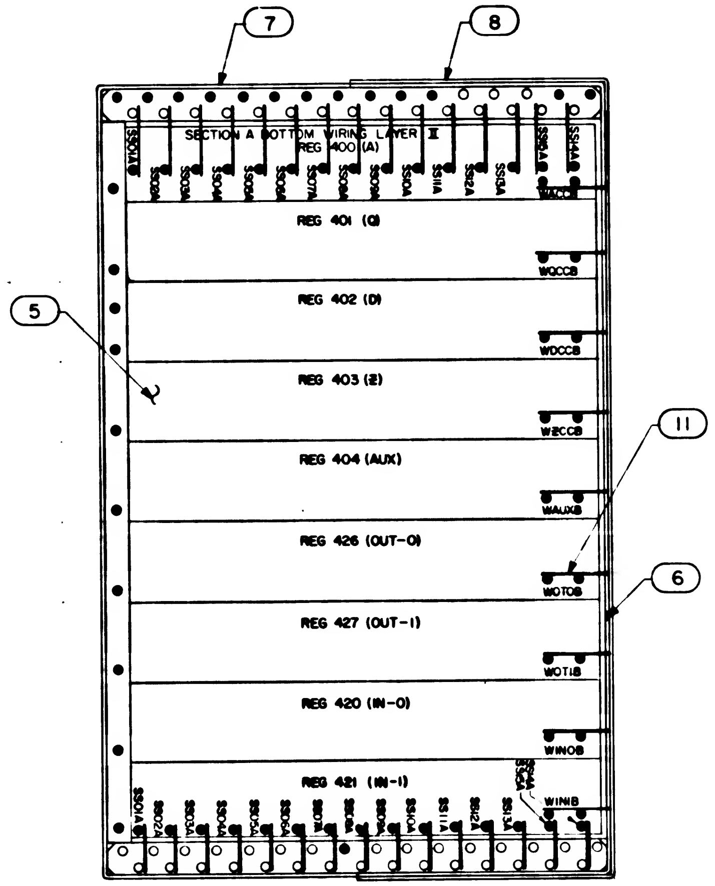
CODE IDENT NO.
SIZE C
NASA DRAWING NO. 1003020
SCALE 2:1
WT
SHEET 1 OF 1

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL





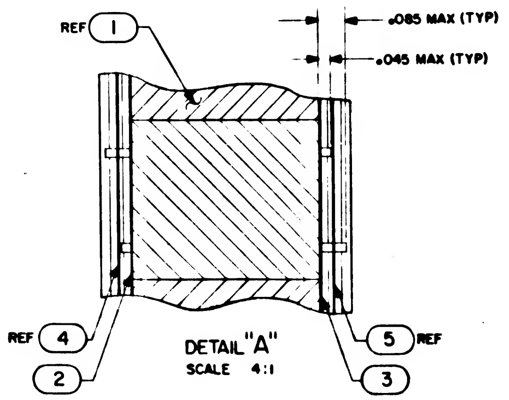


FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00020 DATE 8-23-62

REFERENCE DRAWINGS:
1. WIRING DIAGRAM 1006017
2. WIRING DIAGRAM 1006018
3. WIRING DIAGRAM 1006019

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. CEMENT FIND NOS. 6, 7, & 8 TO FIND NO. 1 PER ND 1002004
3. WELD PER ND 1002005
4. AFTER WELDING CUT WIRE LEADS AS SHOWN PER DETAIL "A"



DETAIL "A"
SCALE 4:1

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

FIND NO	DESCRIPTION	SECTION A 1003023-1	QTY REQD	SECTION B 1003023-2	QTY REQD	SECTION C 1003023-3	QTY REQD
8	MATRIX ASSEMBLY	1003032-3	1	1003032-6	1	1003032-9	1
7	MATRIX ASSEMBLY	1003032-2	1	1003032-5	1	1003032-8	1
6	MATRIX ASSEMBLY	1003032-1	1	1003032-4	1	1003032-7	1
5	MYLAR FILM	1004009-4	1	1004010-4	1	1004011-4	1
4	MYLAR FILM	1004009-3	1	1004010-3	1	1004011-3	1
3	MYLAR FILM	1004009-2	1	1004010-2	1	1004011-2	1
2	MYLAR FILM	1004009-1	1	1004010-1	1	1004011-1	1
1	BANK ASSY S&C REG	1003011	1	1003011	1	1003011	1

LIST OF MATERIALS

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1006757-1	WIRE, ELECTRICAL .010 x .020	11
1	1003020	DIODE BLOCK ASSY S&C REG	10
2	1003019	BLOCK PIN	9
—	SEE CHART	MATRIX ASSEMBLY	8
—	SEE CHART	MATRIX ASSEMBLY	7
—	SEE CHART	MATRIX ASSEMBLY	6
—	SEE CHART	MYLAR FILM	5
—	SEE CHART	MYLAR FILM	4
—	SEE CHART	MYLAR FILM	3
—	SEE CHART	MYLAR FILM	2
—	SEE CHART	BANK ASSY S&C REG	1

APPLICATION

NEXT ASSY	USED ON
1003031	
1003030	
1003024	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT
DRAWN PLACHOWICZ DATE 7-26-62
CHECKED Lee Weston
APPROVAL W.P. Turner
APPROVAL
NASA APPROVAL Jack Barnard
MIT APPROVAL W. Kupfer 8/23/62

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

SUB ASSEMBLY
S&C REGISTER
TABULATED

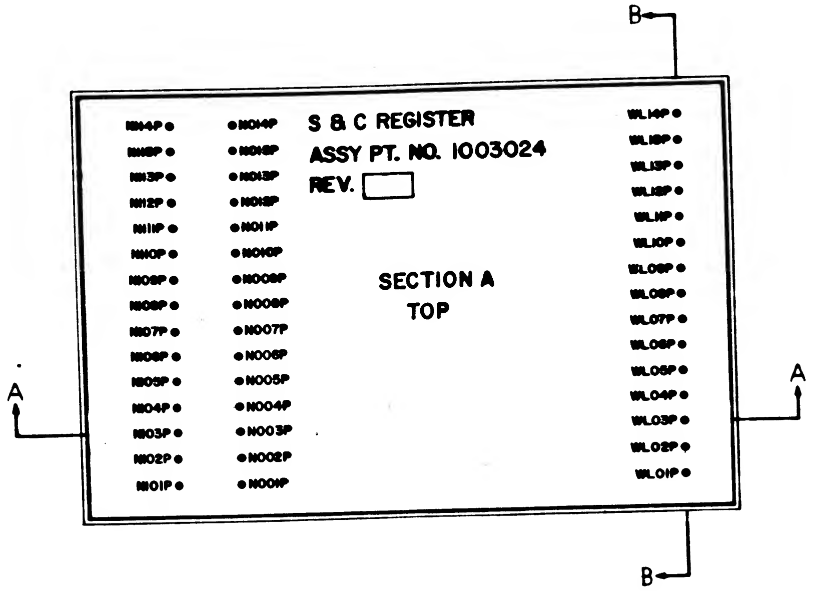
CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003023
SCALE 2/1
WT
SHEET 1 OF 1

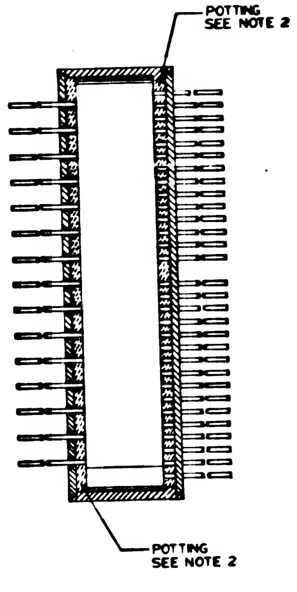
1003023

NOTICE – [illegible]

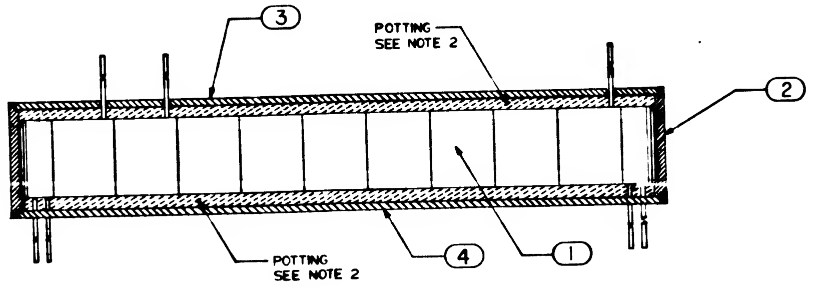
SYM	DESCRIPTION	DATE	APPROVAL

REVISIONS

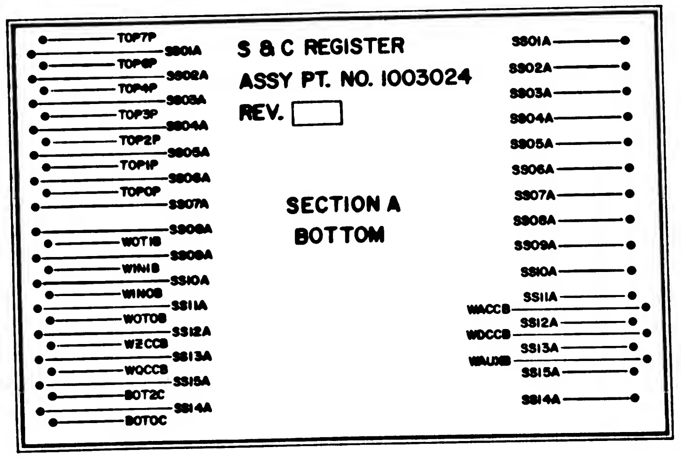




SECTION B-B



SECTION A-A



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00020 DATE 8-23-62

NOTES:
1 INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL D 70327
2. POT AS SHOWN WITH SCOTCH CAST NO. 8 PER ND 1002010

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004034-2	COVER SILK SCREEN S&C REG SECT. A	4
1	1004034-1	COVER SILK SCREEN S&C REG SECT. A	3
1	1004012	SHELL, CASE S&C REGISTER	2
1	1003023	SUB ASSY. S&C REG. SECT. A	1

LIST OF MATERIALS

INCHES
PHOTOGRAPHIC SCALE ONLY

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
CONTRACT

DRAWN TROY DATE 8-18-62
CHECKED Albert Hopkins
APPROVAL Ramon Alonso
APPROVAL
NASA APPROVAL
MIT APPROVAL 8/23

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ASSEMBLY
S&C REGISTER SECTION A

CODE IDENT NO
SIZE E
NASA DRAWING NO 1003024
SCALE 2/1
WT
SHEET 1 OF 1

1003024

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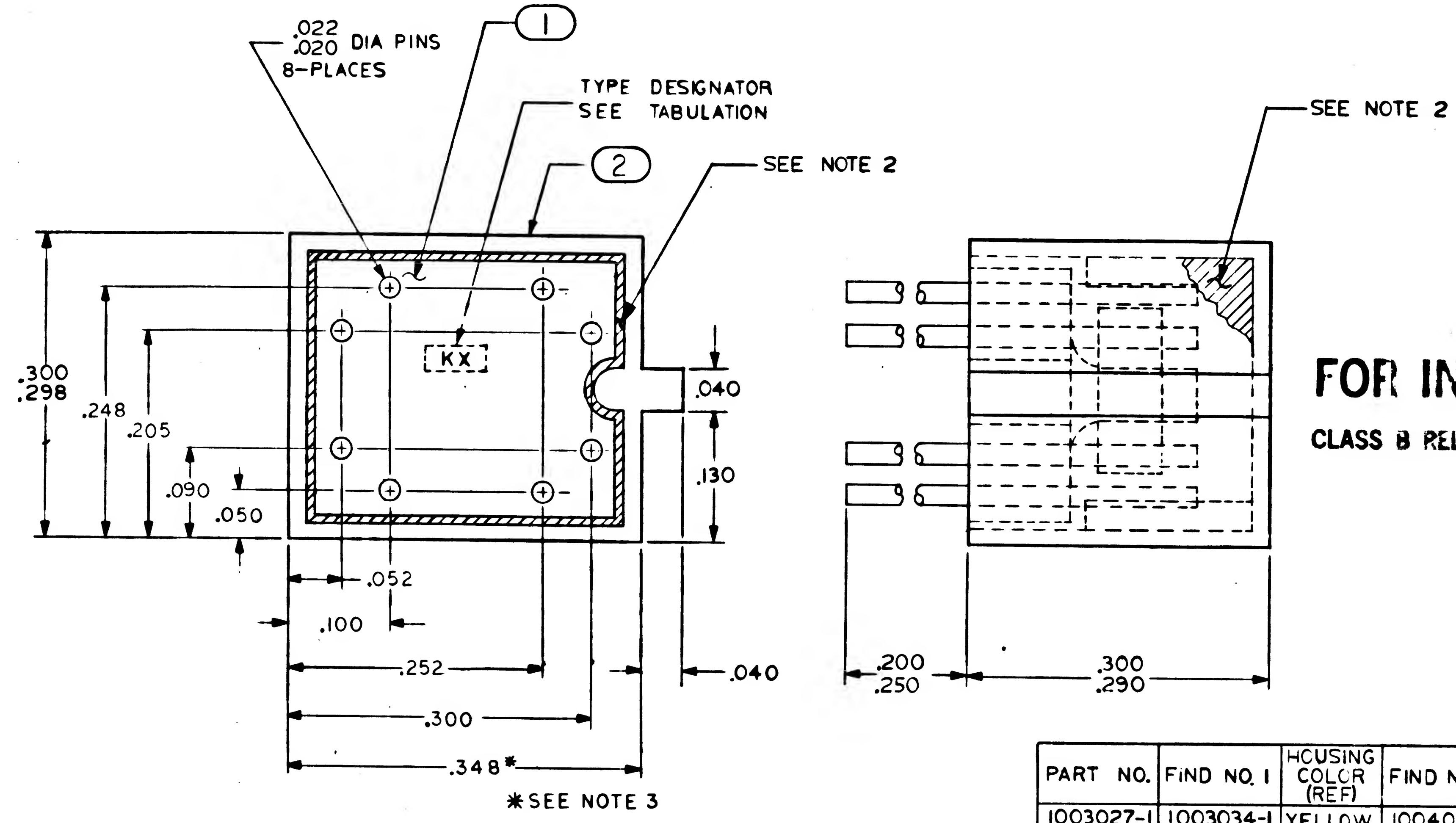
1003027 A

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00072	10.23.62	WK 10/24/62



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00031 **DATE** 9-27-62

PART NO.	FIND NO. 1	HOUSING COLOR (REF)	FIND NO. 2	HOUSING COLOR (REF)	TYPE DESIGNATOR	HOUSING COLOR (REF)
1003027-1	1003034-1	YELLOW	1004020-1	YELLOW	KA	YELLOW
1003027-2	1003034-2	RED	1004020-2	RED	KB	RED
1003027-3	1003034-3	BLUE	1004020-3	BLUE	KC	BLUE

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL–D–70327
2. POT WITH SCOTCH CAST #8 PER ND 1002010
3. ALL DIMENSIONS ARE REFERENCE DIMENSIONS

LIST OF MATERIALS

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
1	SEE CHART	BOX K CORE	2
1	SEE CHART	MOLDING K CORE	1

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT

DRAWN L. SHULMAN DATE ~~8-1-62~~
CHECKED Joe Marton
APPROVAL W.B. Turner 9/27/62
APPROVAL Eldon C Hall
NASA APPROVAL 9-22-62
MIT APPROVAL 9/27/62

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

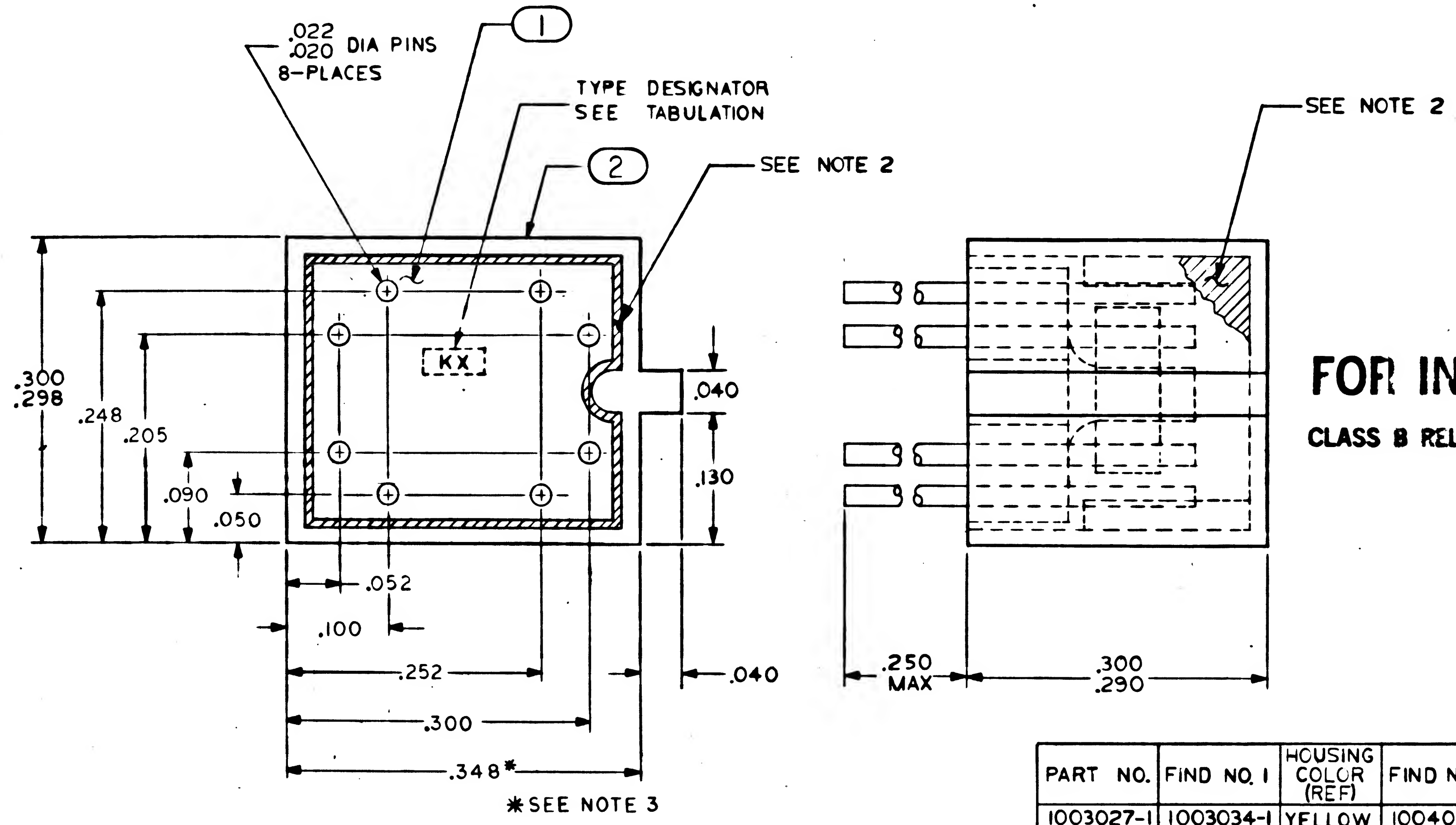
ASSEMBLY
"K" BIT
(TAB)

CODE IDENT NO.
SIZE C
NASA DRAWING NO. 1003027
SCALE 10:1
WT
SHEET OF

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

1003027 -

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL



*SEE NOTE 3

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00031 **DATE** 9-27-62

PART NO.	FIND NO. 1	HOUSING COLOR (REF)	FIND NO. 2	HOUSING COLOR (REF)	TYPE DESIGNATOR	HOUSING COLOR (REF)
1003027-1	1003034-1	YELLOW	1004020-1	YELLOW	KA	YELLOW
1003027-2	1003034-2	RED	1004020-2	RED	KB	RED
1003027-3	1003034-3	BLUE	1004020-3	BLUE	KC	BLUE

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL—D—70327
2. POT WITH SCOTCH CAST #8 PER ND 1002010
3. ALL DIMENSIONS ARE REFERENCE DIMENSIONS

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
1	SEE CHART	BOX K CORE	2
1	SEE CHART	MOLDING K CORE	1

LIST OF MATERIALS

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT

DRAWN L. SHULMAN DATE 8-1-62
CHECKED Joe Marton
APPROVAL WB Turner 9/27/62
APPROVAL Eldon C Hall
NASA APPROVAL WJ Rhine 9-22-62
MIT APPROVAL [illegible] Hazel 9/27/62

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ASSEMBLY
"K" BIT
(TAB)

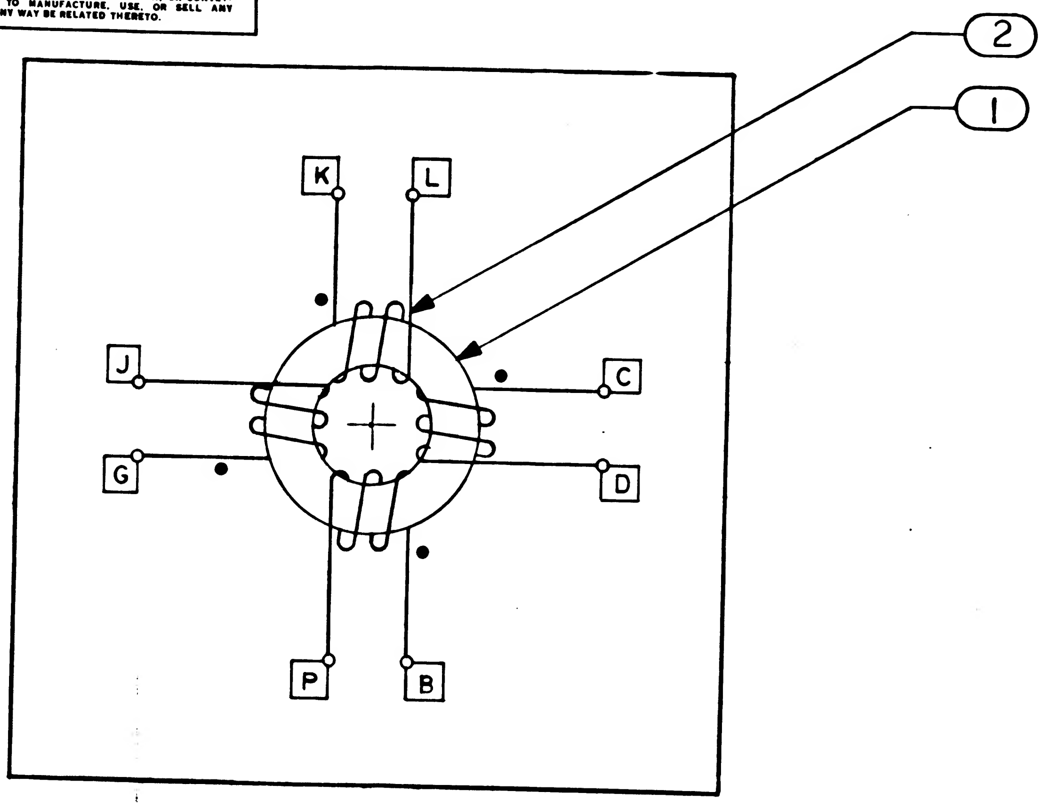
CODE IDENT NO.
SIZE C
NASA DRAWING NO. 1003027
SCALE 10:1
WT
SHEET OF

1003027

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

1003028 A

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00074	10.23.62	WL 10/24/62



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00050 **DATE** 10-4-62

DASH NO	NO TURNS BETWEEN PINS K AND L	PINS J AND G	PINS C AND D	PINS P AND B	TYPE DESIGNATOR
1	20	50	50	20	K A
2	20	50	50	28	K B
3	20	50	50	50	K C

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. NO 38 MAGNET COPPER WIRE, POLYURETHANE COATING, WITH TWO OR MORE COATS OF NYLON

1003028 A

LIST OF MATERIALS

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
A.R.	———	WIRE (SEE NOTE 2)	2
1	1006754	CORE, 11 MAXWELL	1

NEXT ASSY	USED ON
1003034	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO.
CONTRACT
DRAWN W.S. Hart DATE 8-6-62
CHECKED Joe Morton
APPROVAL W.S. Durmer 9/27/62
APPROVAL Duggan
NASA APPROVAL W.J. Rhine 10-4-62
MIT APPROVAL W. Kupfer 10/4/62

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ASSEMBLY, WOUND
K CORE

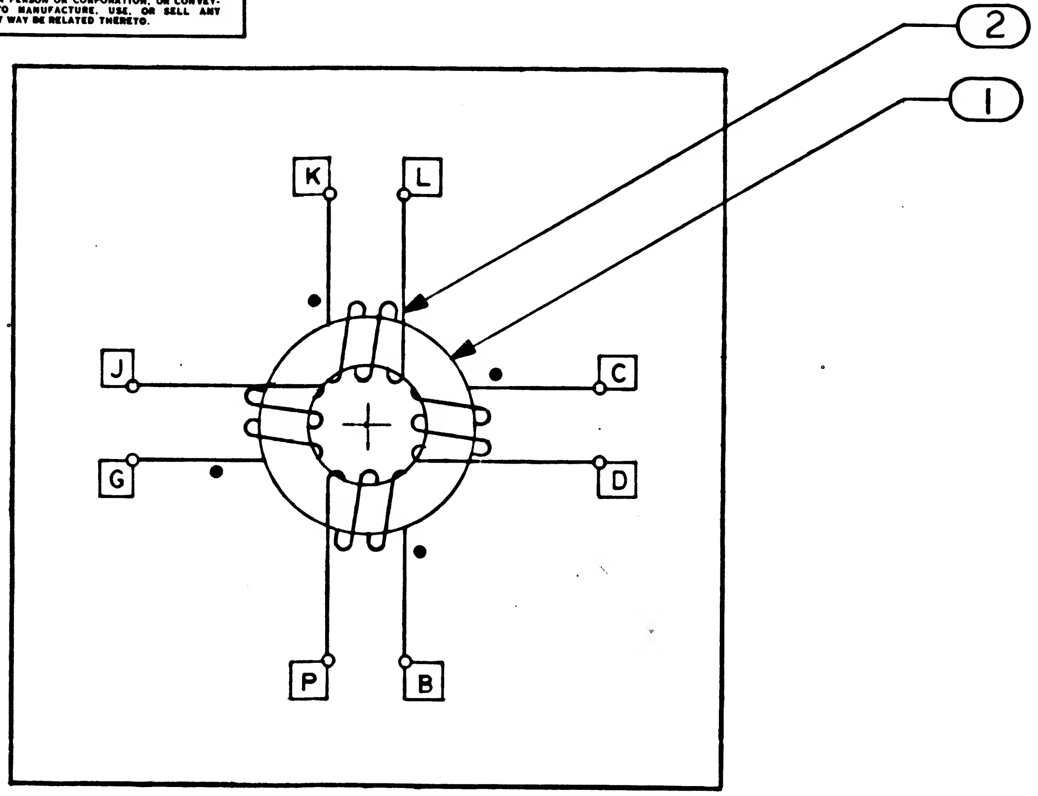
CODE IDENT NO.
SIZE C
NASA DRAWING NO. 1003028
SCALE 10:1
WT
SHEET 1 OF 1

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

1003028

SYM	DESCRIPTION	DATE	APPROVAL

REVISIONS



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00050 **DATE** 10-4-62

DASH NO	NO TURNS BETWEEN PINS K AND L	PINS J AND G	PINS C AND P	PINS P AND B	TYPE DESIGNATOR
1	20	50	50	20	K A
2	20	50	50	28	K B
3	20	50	50	50	K C

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. NO 38 MAGNET COPPER WIRE, POLYEURETHANE COATING, WITH TWO OR MORE COATS OF NYLON

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
A.R.	——	WIRE (SEE NOTE 2)	2
1	1006754	CORE, II MAXWELL	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003034	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN K.S. Hart DATE 8-6-62
CHECKED
APPROVAL W.S. Turner 9/27/62
APPROVAL
NASA APPROVAL 10-4-62
MIT APPROVAL 10/4/62

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ASSEMBLY, WOUND

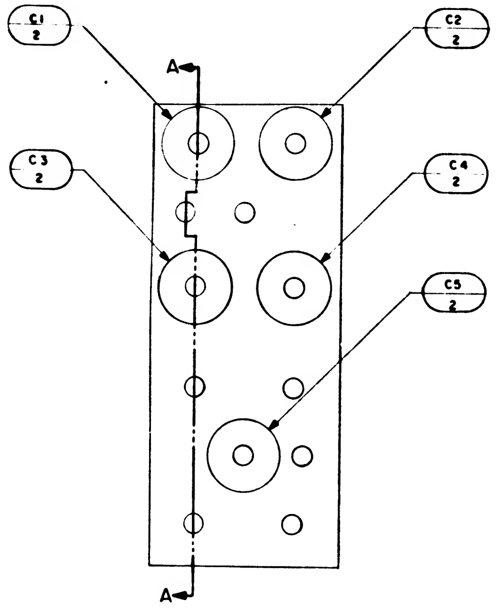
K CORE

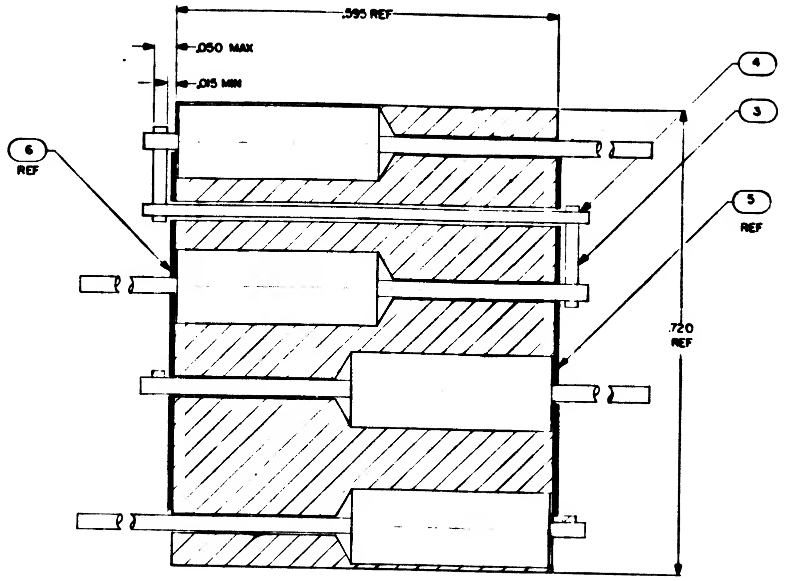
CODE IDENT NO.
SIZE C
NASA DRAWING NO. 1003028
SCALE 10:1
WT
SHEET 1 OF 1

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

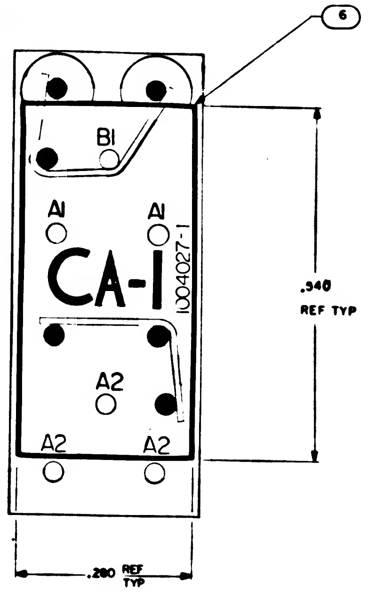
REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
A	NOTES ADDED	8-16-62	
B	ADDED NEXT ASSY. DWG. NO.	9-6-62	
	OBSOLETE PER TDRR 00153	12-18-62	12/20/62





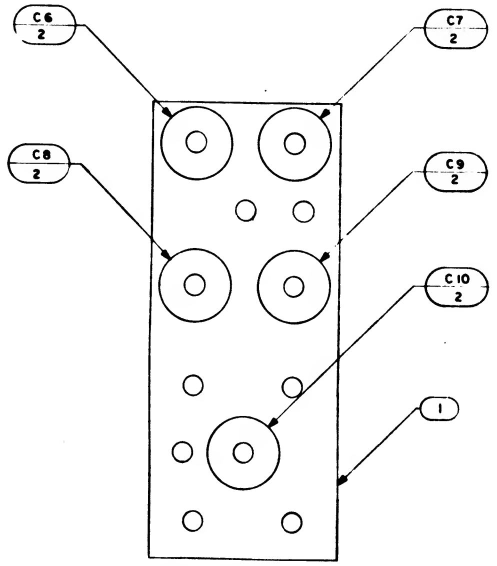
SECTION A-A



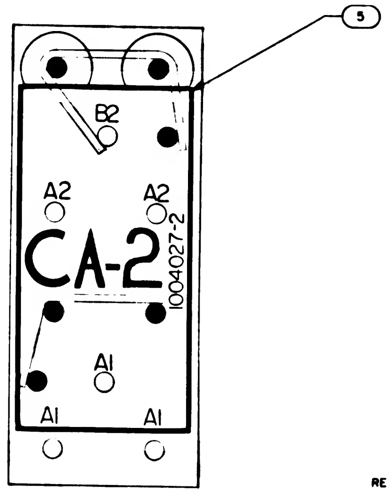
TOP & BOTTOM VIEW
WITH FILM & WIRING
SHOWN

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00004 DATE 8-9-62



FILMS & WIRING REMOVED
FOR CLARITY



REFERENCE:
1. TEST IN ACCORDANCE WITH TEST SPEC ATP 1003029
2. SCHEMATIC 1006021

THIS DRAWING
OBSOLETE
DO NOT USE
SUPERSEDED BY

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. ALL WELDING PER ND 1002005.
3. ● DENOTES LEADS TO BE CUT AFTER WELDING
1/4 MAX ABOVE WELD

LIST OF MATERIALS

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004027-1	MYLAR FILM, TOP	5
1	1004027-2	MYLAR FILM, BOTTOM	5
AR	1006758-2	WIRE, ELECTRICAL, ROUND	4
AR	1006757	WIRE, ELECTRICAL (.010 X .020)	3
10	1006777-1	CAPACITOR, MOLDED	2
1	1004022-3	MODULE, INJECTION MOLDING	1

NEXT ASSY	USED ON
1003041	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT
DRAWN P. Hart DATE 8-2-62
CHECKED Joe Martin
APPROVAL W. E. Dunn
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

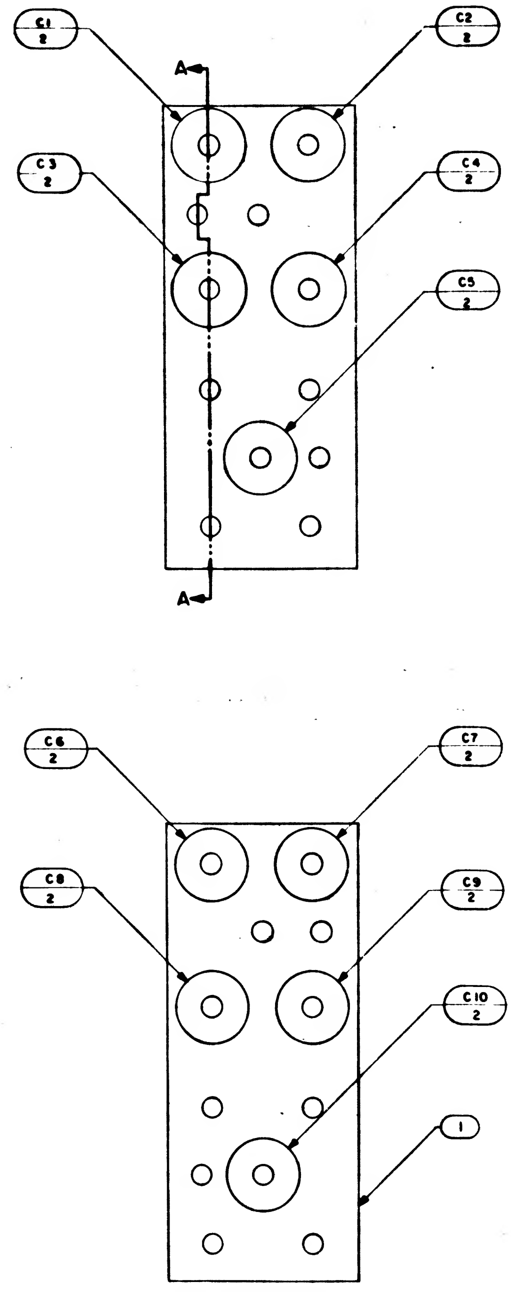
MODULE ASSEMBLY
"CA" CIRCUIT

CODE IDENT NO. SIZE E NASA DRAWING NO 1003029
SCALE 10:1 WT SHEET 1 OF 1

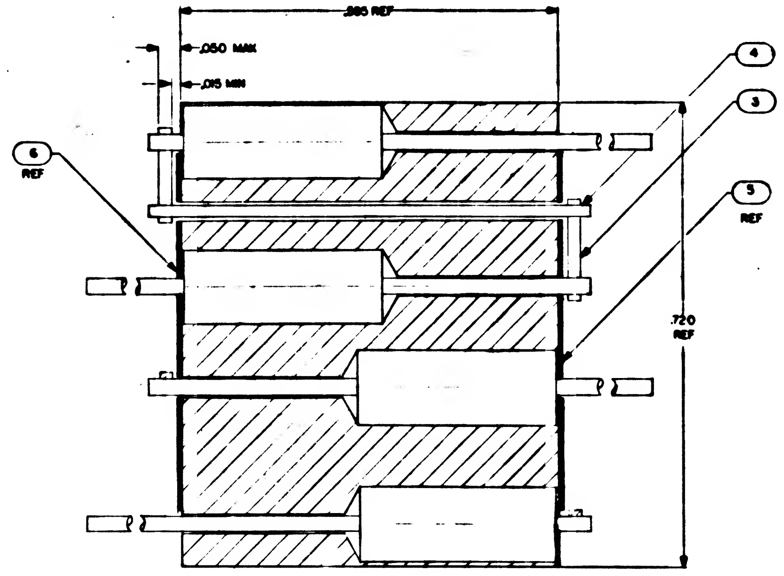
1003029 B

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

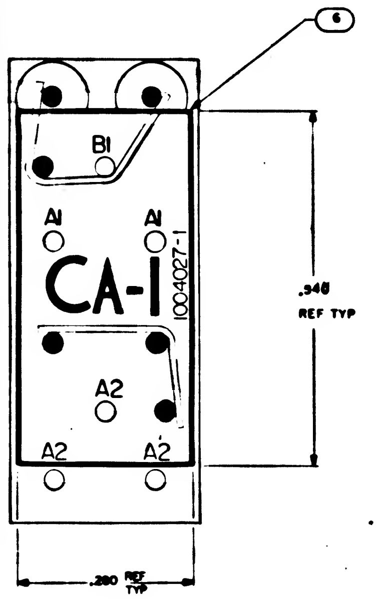
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	NOTES ADDED	8-16-62	



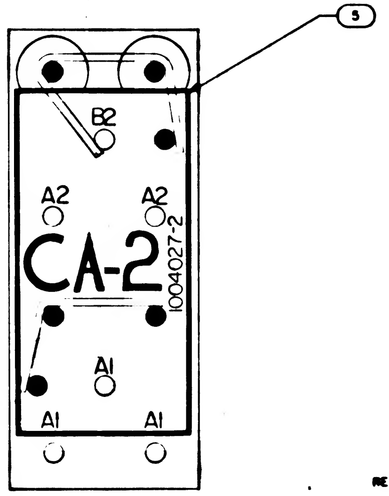
FILMS & WIRING REMOVED FOR CLARITY



SECTION A-A



TOP & BOTTOM VIEW
WITH FILM & WIRING
SHOWN



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00004 DATE 8-9-62

REFERENCE:
1. TEST IN ACCORDANCE WITH TEST SPEC ATP 1003029
2. SCHEMATIC 1006021

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. ALL WELDING PER ND-1002005.
3. ● DENOTES LEADS TO BE CUT AFTER WELDING 1/4 MAX ABOVE WELD

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004027-1	MYLAR FILM, TOP	6
1	1004027-2	MYLAR FILM, BOTTOM	5
AR	1006758-2	WIRE, ELECTRICAL, ROUND	4
AR	1006757	WIRE, ELECTRICAL (.010 X .020)	3
10	1006777-1	CAPACITOR, MOLDED	2
1	1004022-3	MODULE, INJECTION MOLDING	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

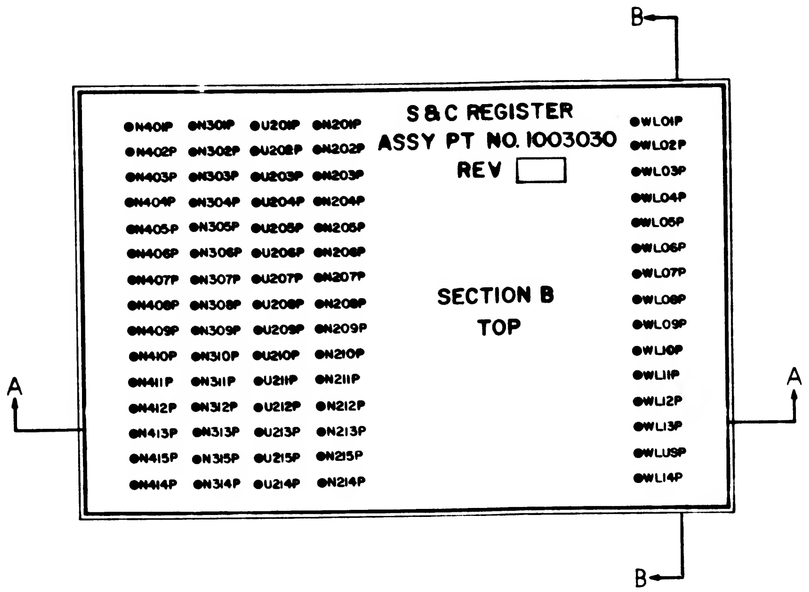
MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT
DRAWN W. S. Hart DATE 8-9-62
CHECKED Joe Martin
APPROVAL W. B. [illegible] 8/16/62
APPROVAL
NASA APPROVAL Jack Barnard
MIT APPROVAL

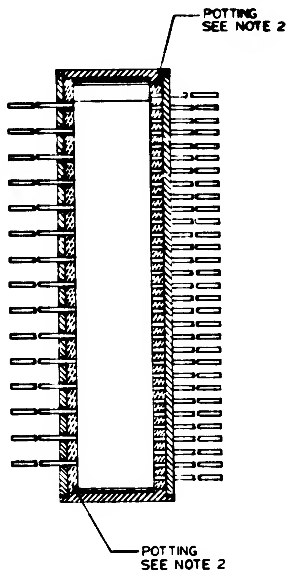
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MODULE ASSEMBLY
CA CIRCUIT

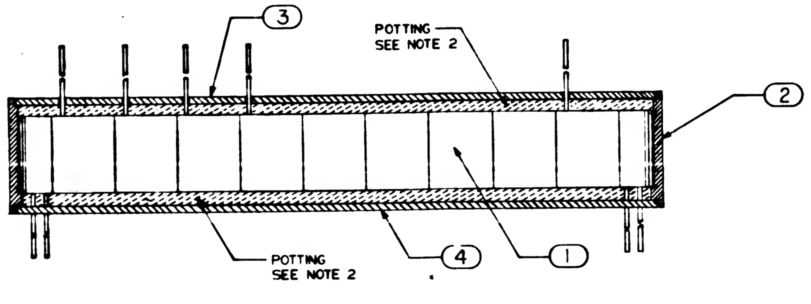
CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003029
SCALE 10:1
WT
SHEET OF

1003029 A

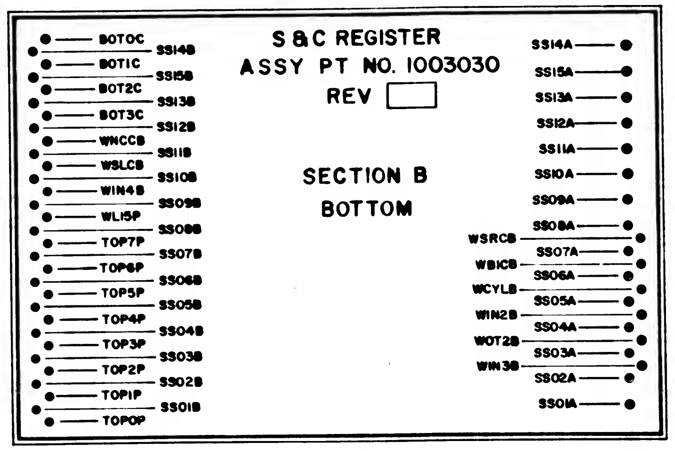




SECTION B-B



SECTION A-A



REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00020 DATE 8-23-62

NOTES:
1 INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL D 70327
2. POT AS SHOWN WITH SCOTCH CAST NO.8 PER NO 1002010

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004035-2	COVER, SILK SCREEN, S & C REGISTER	4
1	1004035-1	COVER, SILK SCREEN, S & C REGISTER	3
1	1004012	SHELL, CASE S&C REGISTER	2
1	1003023	SUB-ASSY, S & C REGISTER, SECTION B	1

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

M I T
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT
DRAWN W HORGAN DATE 8-21-62
CHECKED Tamas Blomog
APPROVAL Albert Hopkins
APPROVAL D Duggan
NASA APPROVAL
MIT APPROVAL W. Kupfer 8/24/62

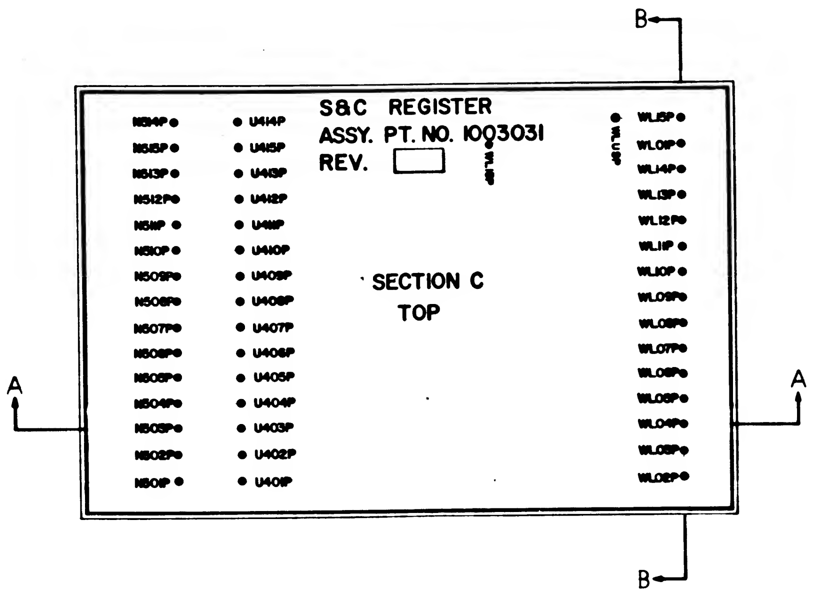
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

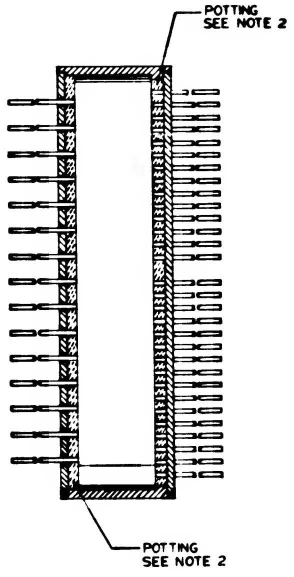
ASSEMBLY
S&C REGISTER SECTION B

CODE IDENT NO.
SIZE E
NASA DRAWING NO 1003030
SCALE 2/1
WT
SHEET OF

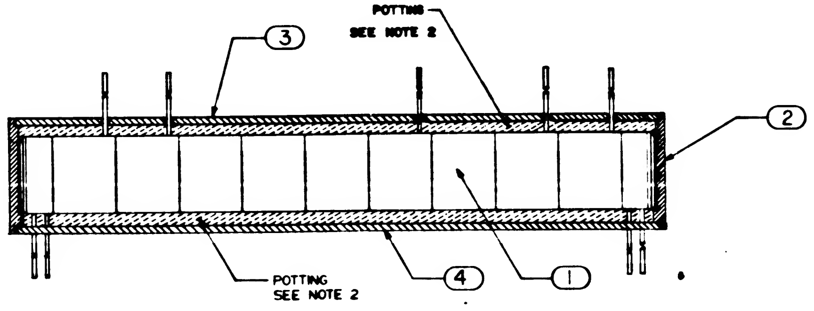
1003030

NOTICE [illegible]

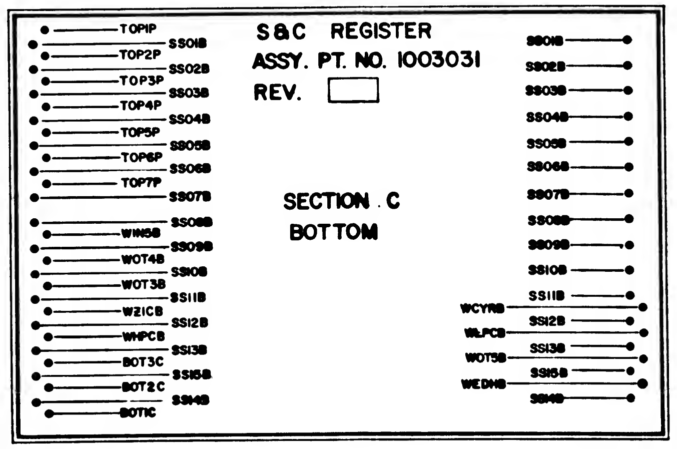




SECTION B-B



SECTION A-A



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00020 DATE 8·23·62

NOTES:

1 INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL D 70327
2. POT AS SHOWN WITH SCOTCH CAST NO. 8 PER ND 1002010

INCHES
PHOTOGRAPHIC SCALE ONLY

1	1004036-2	COVER SILK SCREEN S&C REG. SECT. C	4
1	1004036-1	COVER SILK SCREEN S&C REG. SECT. C	3
1	1004012	SHELL CASE S&C REGISTER	2
1	1003023	SUB ASSY. S&C REG. SECT. C	1
QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

M I T
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT

DRAWN DEMPSKI DATE 7-31-62
CHECKED [illegible] Hopkins
APPROVAL [illegible]
APPROVAL [illegible]
NASA APPROVAL [illegible]
MIT APPROVAL [illegible]

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ASSEMBLY
S&C REGISTER SECTION C

CODE IDENT NO
SIZE E
NASA DRAWING NO 1003031
SCALE 2/1
WT
SHEET OF

1003031

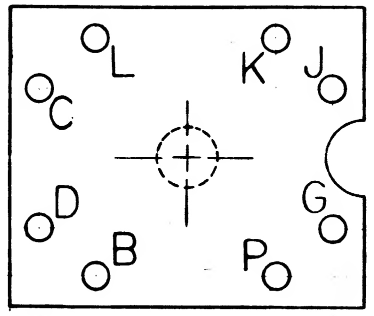
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

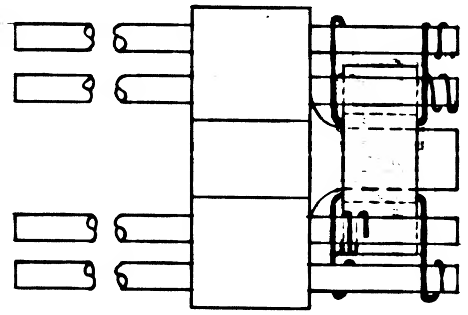
1003034

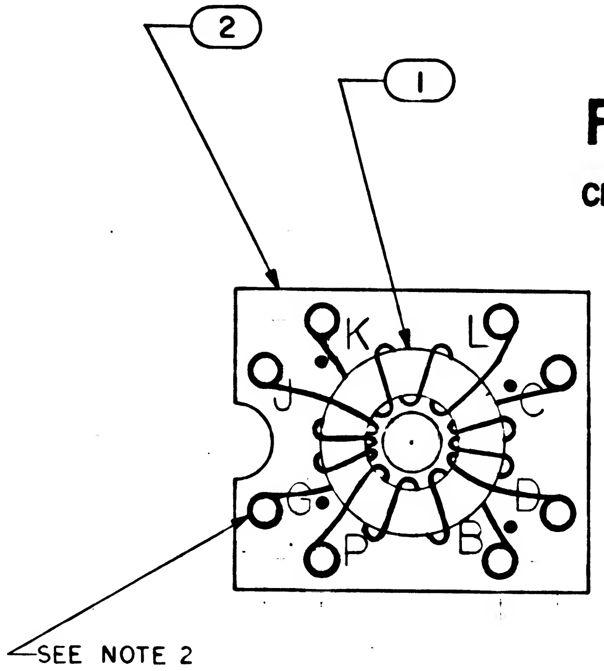
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00050 **DATE** 10-4-62







PART NO.	FIND NO. 1	FIND NO. 2	TYPE DESIGNATOR	HOUSING COLOR
1003034-1	1003028-1	1004019-1	KA	YELLOW
1003034-2	1003028-2	1004019-2	KB	RED
1003034-3	1003028-3	1004019-3	KC	BLUE

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. SOLDER LEADS IN ACCORDANCE WITH ND-1002011

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
1	SEE CHART	MOLDING, K CORE	2
1	SEE CHART	ASSEMBLY, WOUND, K CORE	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003027	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± // DECIMALS ± // ANGLES ± //
DO NOT SCALE THIS DRAWING
MATERIAL //
HEAT TREATMENT //
FINAL FINISH //

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT

DRAWN L. SHULMAN DATE 8/27/62
CHECKED
APPROVAL 9/27/62
APPROVAL
NASA APPROVAL 10-4-62
MIT APPROVAL 10/4/62

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

SUB ASSEMBLY
K CORE

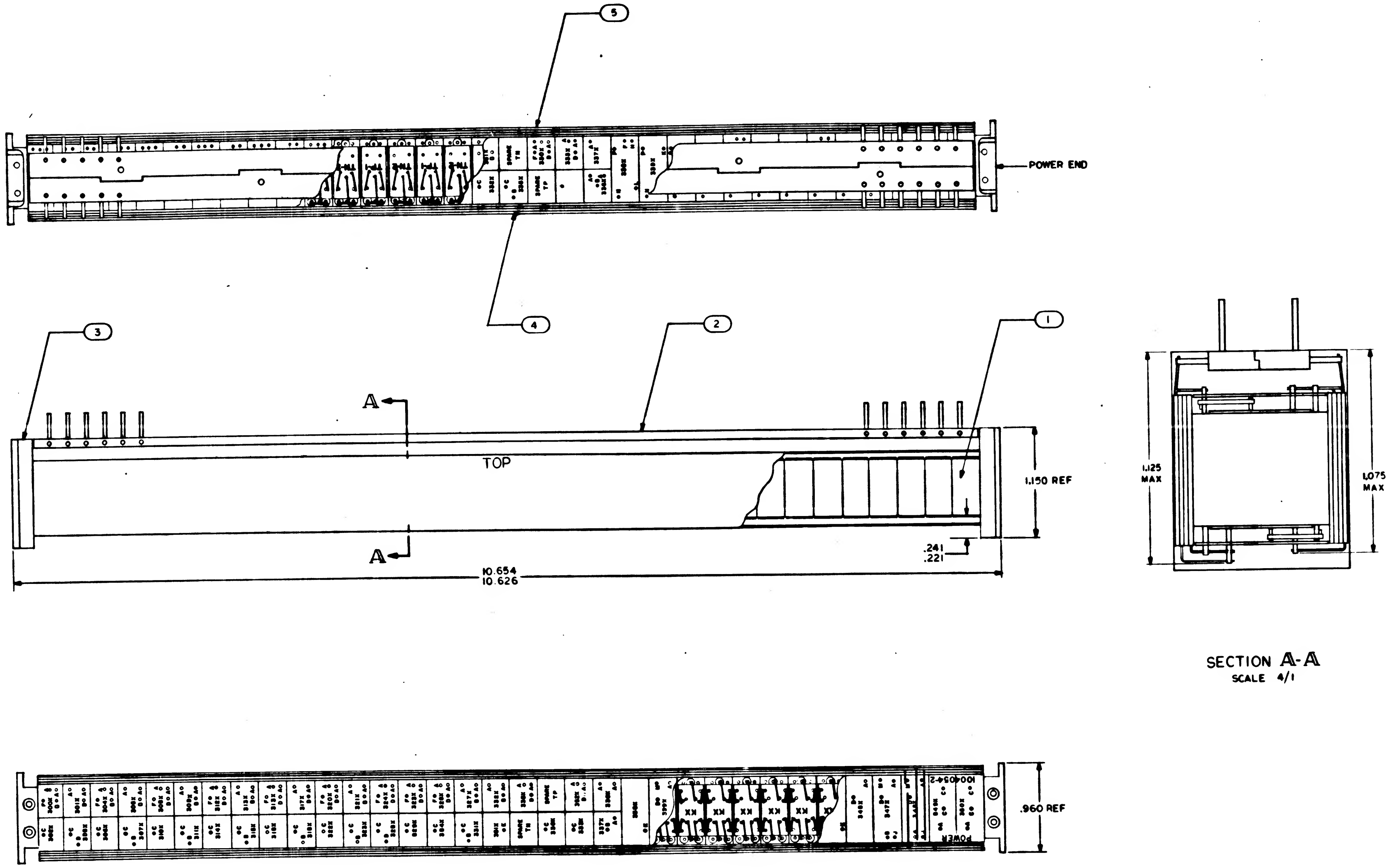
CODE IDENT NO.
SIZE C
NASA DRAWING NO. 1003034
SCALE 10:1
WT
SHEET 1 OF 1

1003034

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00070	[illegible]	[illegible]



SECTION A-A
SCALE 4/1

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00050 DATE 10-4-62

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ALL WELDING PER ND 1002005
3. BOND FIND NUMBERS 3,4 AND 5 PER ND

LIST OF MATERIALS

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1003032-2	MATRIX ASSEMBLY (RIGHT)	5
1	1003032-1	MATRIX ASSEMBLY (LEFT)	4
2	1004051	STICK END PLATE	3
2	1003037	ASSEMBLY, STICK HEADER COMP STICK	2
1	1003040	ARITHMETIC STICK ULB	

NEXT ASSY	USED ON
1003038-1	

APPLICATION

INCHES
PHOTOGRAPHIC SCALE ONLY

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO
CONTRACT

DRAWN S.A. Borannis DATE 9-4-62
CHECKED 10-3-62
APPROVAL
APPROVAL
NASA APPROVAL 10-4-62
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

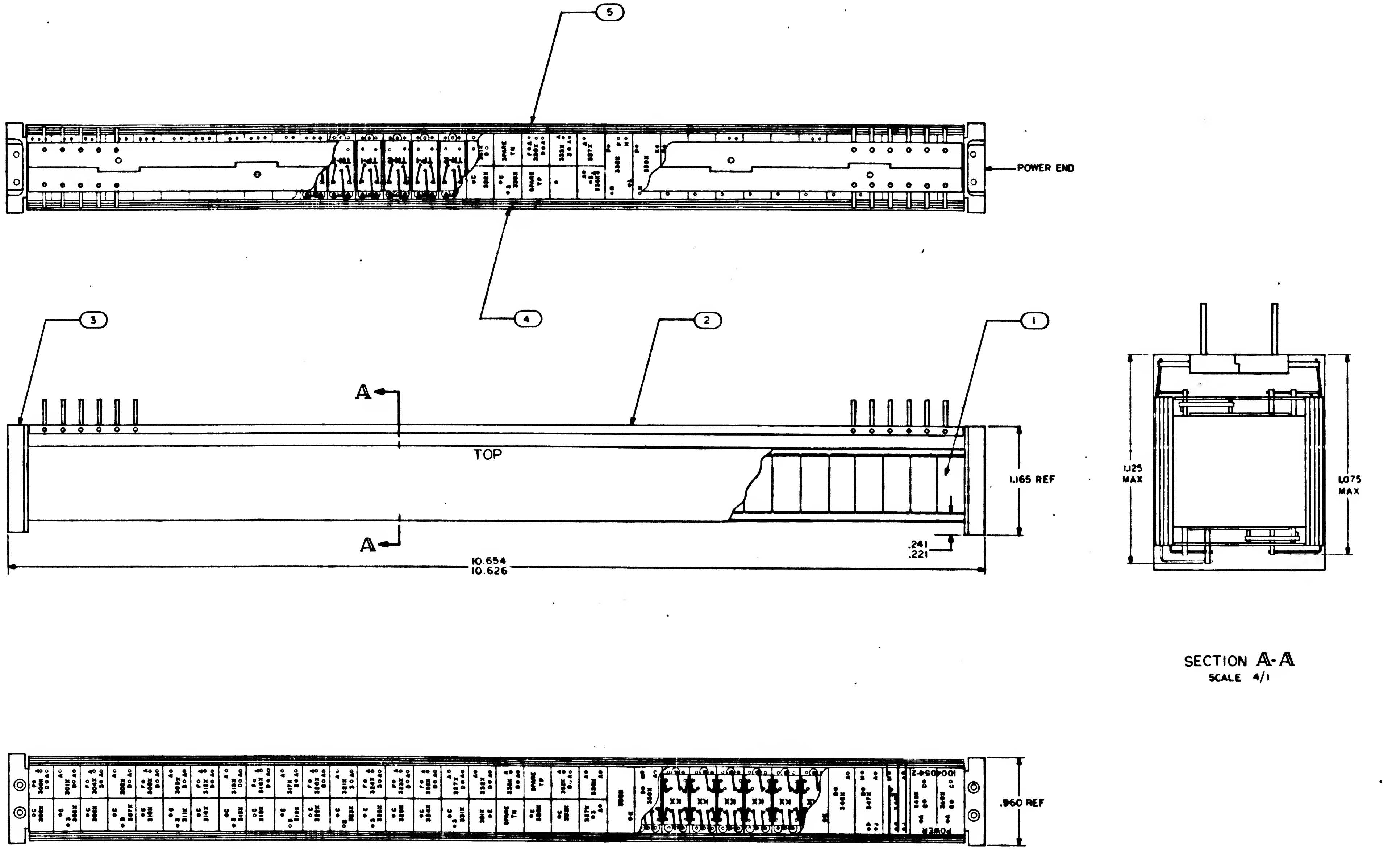
ASSEMBLY
ARITHMETIC STICK

CODE IDENT NO.
SIZE E
NASA DRAWING NO 1003039
SCALE 2/1
WT
SHEET 1 OF 1

1003039 A

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL



SECTION A-A
SCALE 4/1

FOR INFORMATION ONLY
CLASS B RELEASE TDR No. 00050 DATE 10-4-62

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ALL WELDING PER ND 1002005
3. BOND FIND NUMBERS 3, 4 AND 5 PER ND

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1003032-2	MATRIX ASSEMBLY (RIGHT)	5
1	1003032-1	MATRIX ASSEMBLY (LEFT)	4
2	1004051	STICK END PLATE	3
2	1003037	ASSEMBLY, STICK HEADER COMP STICK	2
1	1003040	ARITHMETIC STICK ULB	

LIST OF MATERIALS

1003038-1	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT
DRAWN S.A. Borannigo DATE 9-4-62
CHECKED 10-3-62
APPROVAL Joe Morton
APPROVAL
NASA APPROVAL W.J. Rhine 10-4-62
MIT APPROVAL 10/4/62

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

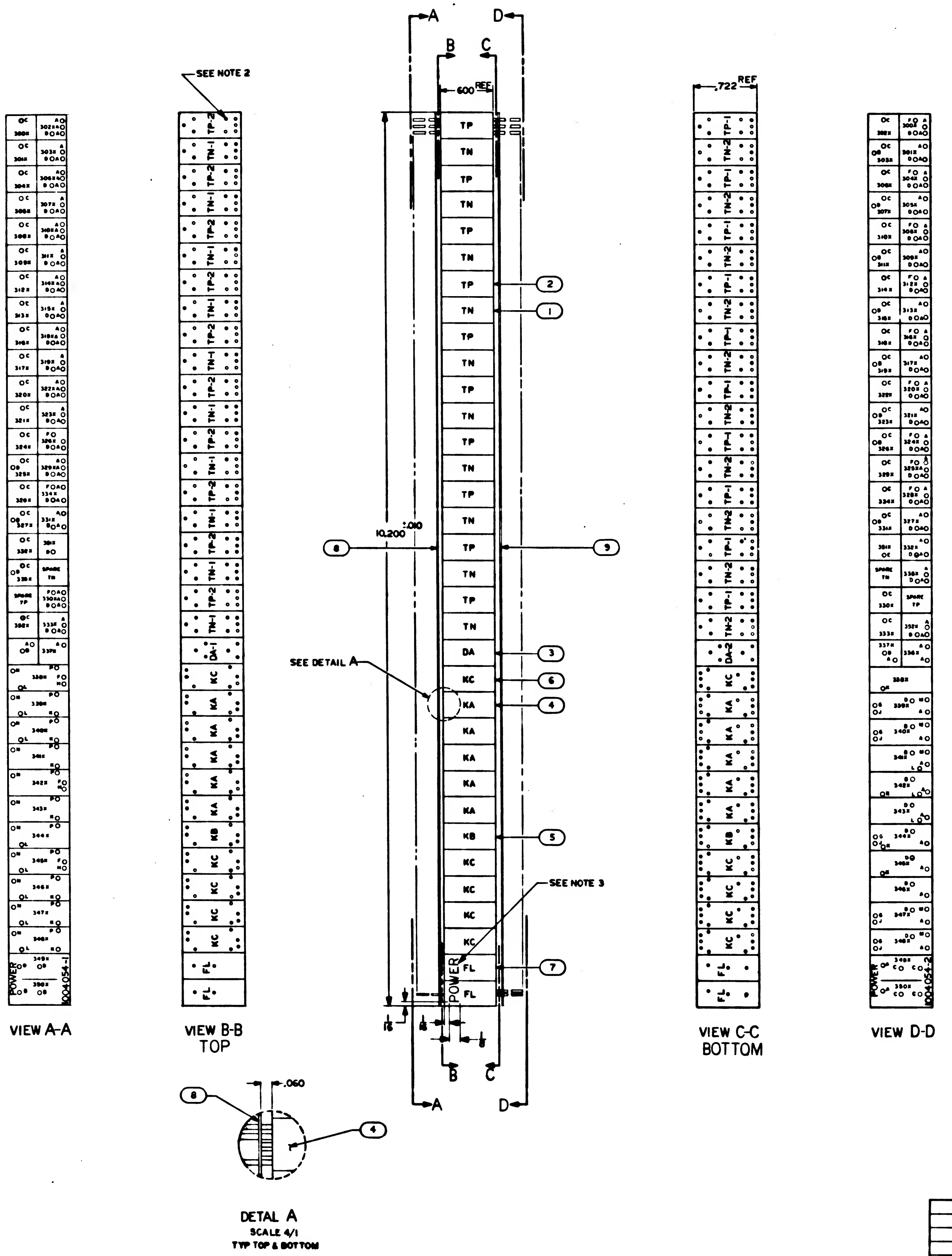
ASSEMBLY
ARITHMETIC STICK

CODE IDENT NO
SIZE E
NASA DRAWING NO. 1003039
SCALE 2/1
WT
SHEET 1 OF 1

1003039

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL



DETAIL A
SCALE 4/1
TYP TOP & BOTTOM

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00050 DATE 10-4-62

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDANDARDS PRESCRIBED BY MIL-D-70327
2. ● DENOTES LEADS TO BE CUT .030 MAX BEFORE INSTALLING TOP & BOTTOM STICK FILMS
3. MARKING: MARK 1/8 HIGH BLACK GOTHIC CHARACTERS LOCATED AS SHOWN PER MIL-STD-130 (STENCILED)
4. MODULE ASSEMBLIES TO BE BONDED PER ND 1002004.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004054-2	MYLAR FILM (BOTTOM)	9
1	1004054-1	MYLAR FILM (TOP)	8
2	1003005	MODULE ASSEMBLY, FL CIRCUIT	7
5	1003000-3	MODULE ASSEMBLY, KC CIRCUIT	6
1	1003000-2	MODULE ASSEMBLY, KB CIRCUIT	5
5	1003000-1	MODULE ASSEMBLY, KA CIRCUIT	4
1	1003002	MODULE ASSEMBLY, DA CIRCUIT	3
10	1003001	MODULE ASSEMBLY, TP CIRCUIT	2
10	1003004	MODULE ASSEMBLY, TN CIRCUIT	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003039	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ±1/64 DECIMALS ±.005 ANGLES ± —
DO NOT SCALE THIS DRAWING

MATERIAL —//—
HEAT TREATMENT —//—
FINAL FINISH —//—

M I T
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT

DRAWN W. T. Frey DATE 9-19-62
CHECKED W. McKinty 10-3-62
APPROVAL
APPROVAL
NASA APPROVAL 10-4-62
MIT APPROVAL 10/4/62

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

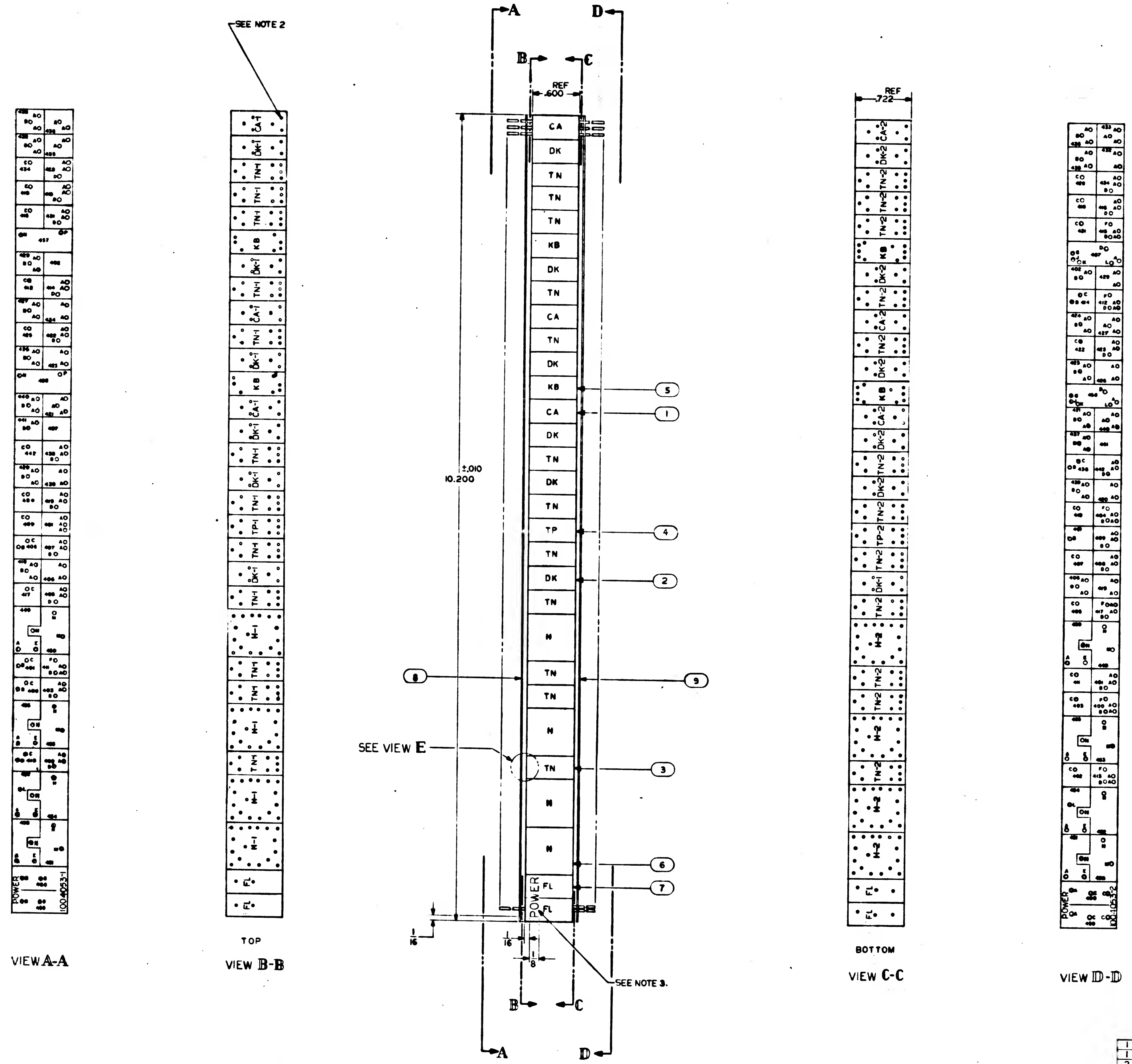
ARITHMETIC STICK ULB

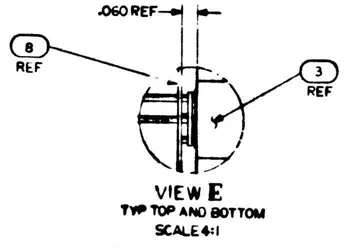
CODE IDENT NO
SIZE E
NASA DRAWING NO 1003040
SCALE 2/1
WT
SHEET 1 OF 1

1003040 — 1

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00068	10-17-62	





VIEW E
TYP TOP AND BOTTOM
SCALE 4:1

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00050 DATE 10-4-62

NOTES:

1. INTERRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. ● DENOTES LEADS TO BE CUT BEFORE INSTALLING TOP AND BOTTOM PULSE STICK FILMS.
3. MARKING: MARK 1/8 INCH HIGH BLACK GOTHIC CHARACTERS LOCATED AS SHOWN PER MIL-STD-130 (STENCIL).
4. MODULE ASSEMBLIES TO BE BONDED PER ND 1002004.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004053-2	MYLAR FILM, BOTTOM	9
1	1004053-1	MYLAR FILM, TOP	8
2	1003005	MODULE ASSEMBLY FL CKT	7
4	1003046-1	MODULE ASSEMBLY H CKT	6
2	1003000-2	MODULE ASSEMBLY KB CKT	5
1	1003001	MODULE ASSEMBLY TP CKT	4
12	1003004	MODULE ASSEMBLY TN CKT	3
6	1003003	MODULE ASSEMBLY DK CKT	2
3	1003029	MODULE ASSEMBLY CA CKT	1

LIST OF MATERIALS

1003045	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± 1/64 DECIMALS ±.005 ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

PHOTOGRAPHIC SCALE ONLY
INCHES

M I T
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO
CONTRACT
DRAWN W. Horgan DATE 9-17-62
CHECKED 10-1-62
APPROVAL Joe Morton
APPROVAL
NASA APPROVAL 10-4-62
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

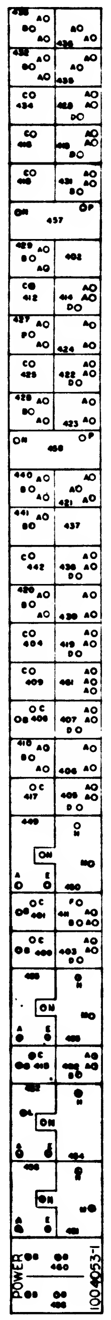
ARITHMETIC PULSE STICK ULB

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003041
SCALE 2:1
WT
SHEET 1 OF 1

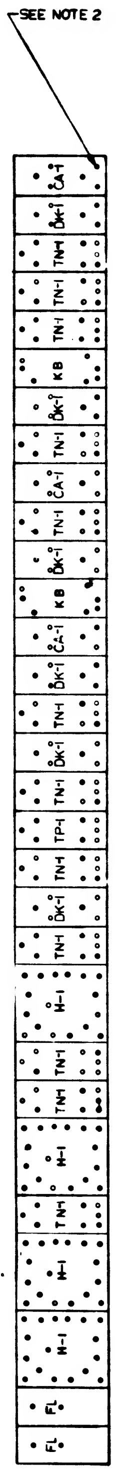
1003041

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

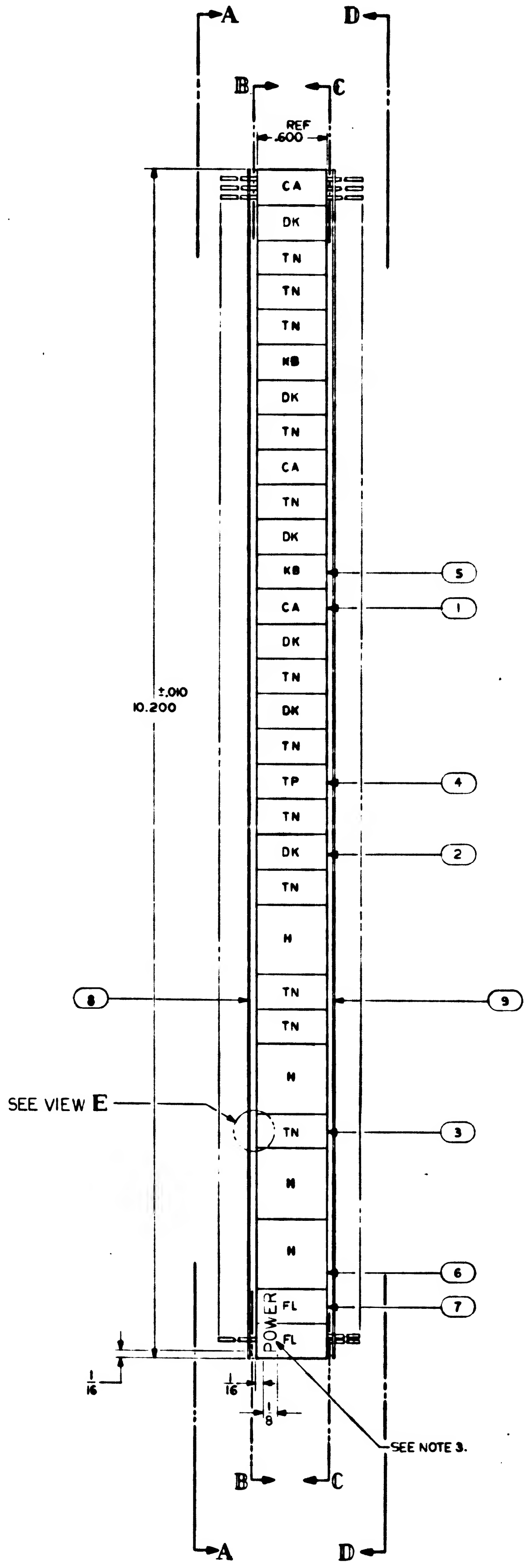


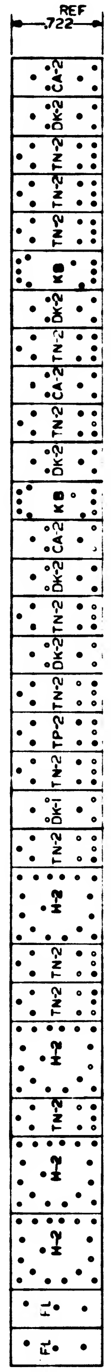
VIEW A-A



TOP

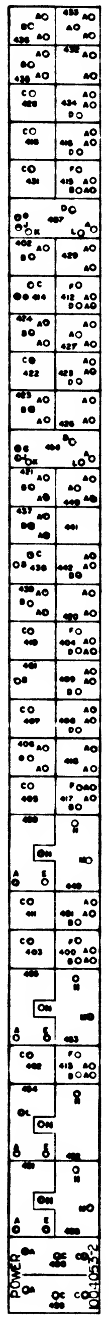
VIEW B-B





BOTTOM

VIEW C-C



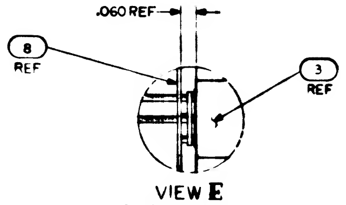
VIEW D-D

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00050 DATE 10-4-62

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. ● DENOTES LEADS TO BE CUT BEFORE INSTALLING TOP AND BOTTOM PULSE STICK FILMS.
3. MARKING: MARK $\frac{1}{8}$ INCH HIGH BLACK GOTHIC CHARACTERS LOCATED AS SHOWN PER MIL-STD-130 (STENCIL).
4. MODULE ASSEMBLIES TO BE BONDED PER ND 1002004.



VIEW E
TYP TOP AND BOTTOM
SCALE 4:1

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004053-2	MYLAR FILM, BOTTOM	9
1	1004053-1	MYLAR FILM, TOP	8
2	1003000	MODULE ASSEMBLY FL CKT	7
4	1003010	MODULE ASSEMBLY H CKT	6
2	1003033	MODULE ASSEMBLY KB CKT	5
1	1003001	MODULE ASSEMBLY TP CKT	4
12	1003004	MODULE ASSEMBLY TN CKT	3
6	1003003	MODULE ASSEMBLY DK CKT	2
3	1003029	MODULE ASSEMBLY CA CKT	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003045	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± 1/64 DECIMALS ±.005 ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT
DRAWN DATE 9-7-62
CHECKED 10-1-62
APPROVAL
APPROVAL
NASA APPROVAL 10-4-62
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ARITHMETIC PULSE STICK ULB

CODE IDENT NO. | SIZE E | NASA DRAWING NO. 1003041
SCALE 2:1 | WT | SHEET 1 OF 1

1003041

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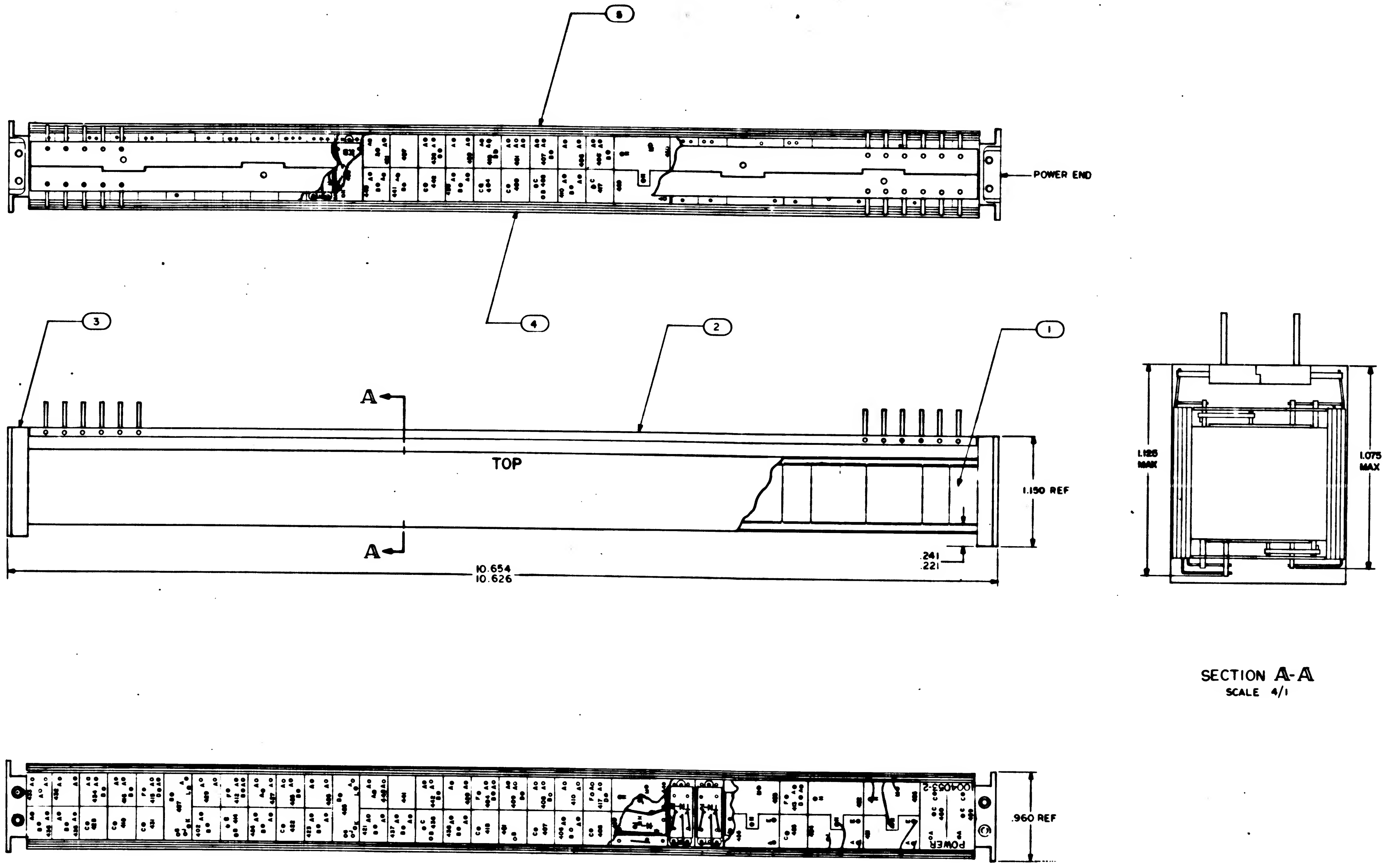
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00069	10-16-6	



SECTION A-A
SCALE 4/1

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00050 DATE 10-4-62

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ALL WELDING PER ND 1002005
3. BOND FIND NUMBERS 3, 4 AND 5 PER ND 1002064.

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1003032-4	MATRIX ASSEMBLY (RIGHT)	5
1	1003032-3	MATRIX ASSEMBLY (LEFT)	4
2	1004051	STICK END PLATE	3
2	1003037	ASSEMBLY, STICK HEADER COMP STICK	2
1	1003041	ARITHMETIC PULSE STICK ULB	1

LIST OF MATERIALS

INCHES
PHOTOGRAPHIC SCALE ONLY

NEXT ASSY	USED ON
1003038-2	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

M I T
INSTRUMENTATION LAB
CAMBRIDGE MASS
DRAWN DATE 9-18-62
CHECKED
APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

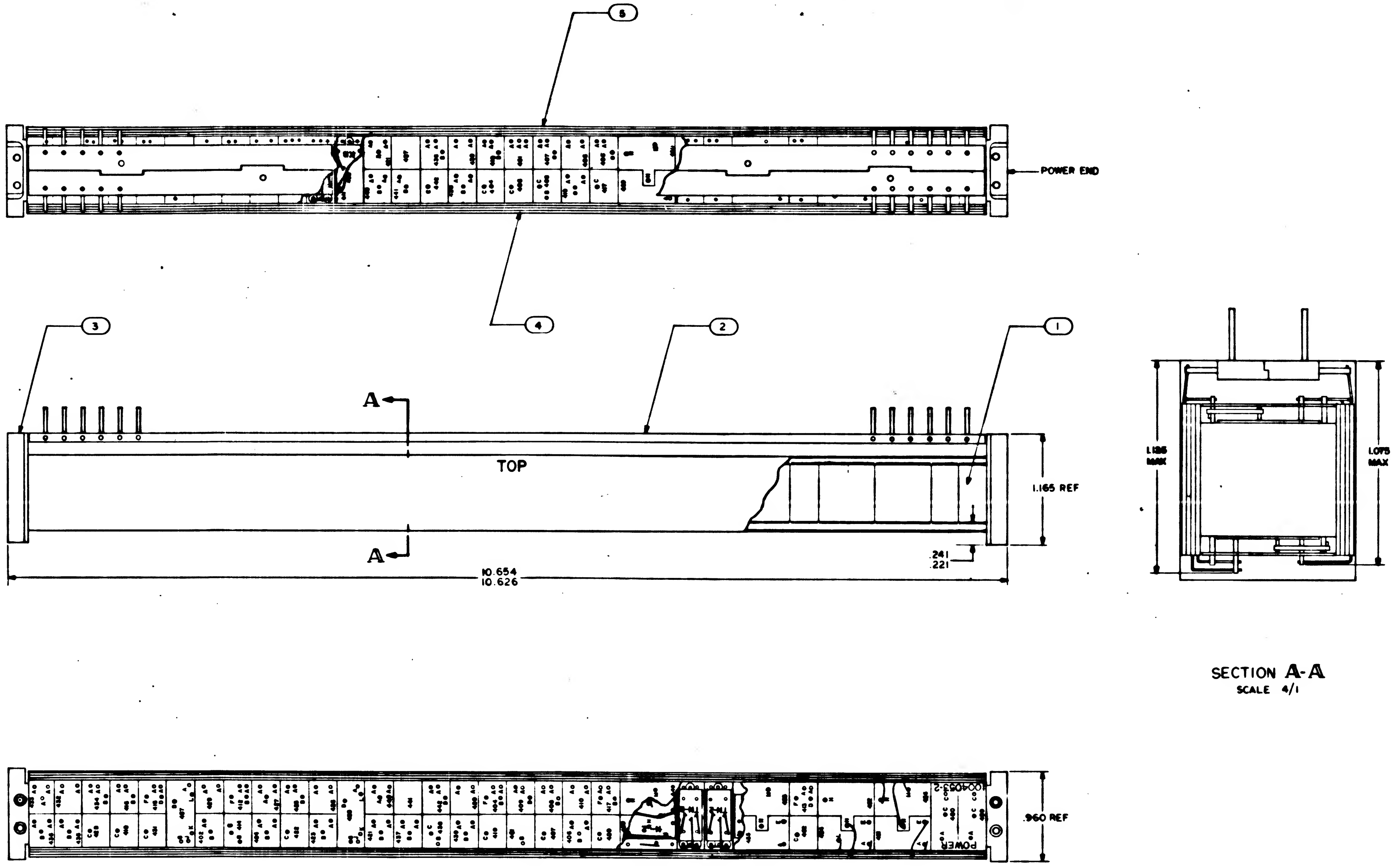
ASSEMBLY,
ARITHMETIC PULSE STICK

CODE IDENT NO.
SIZE E
NASA DRAWING NO 1003045
SCALE 2/1
WT
SHEET 1 OF 1

1003045 A

NOTICE – WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL



SECTION A-A
SCALE 4/1

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00050 DATE 10-4-62

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ALL WELDING PER ND 1002005
3. BOND FIND NUMBERS 3, 4 AND 5 PER ND 1002004.

LIST OF MATERIALS

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1003032-4	MATRIX ASSEMBLY (RIGHT)	5
1	1003032-3	MATRIX ASSEMBLY (LEFT)	4
2	1004051	STICK END PLATE	3
2	1003037	ASSEMBLY, STICK HEADER COMP STICK	2
1	1003041	ARITHMETIC PULSE STICK ULB	1

NEXT ASSY	USED ON
1003038-2	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO
CONTRACT
DRAWN DATE 9-18-62
CHECKED 10-4-62
APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

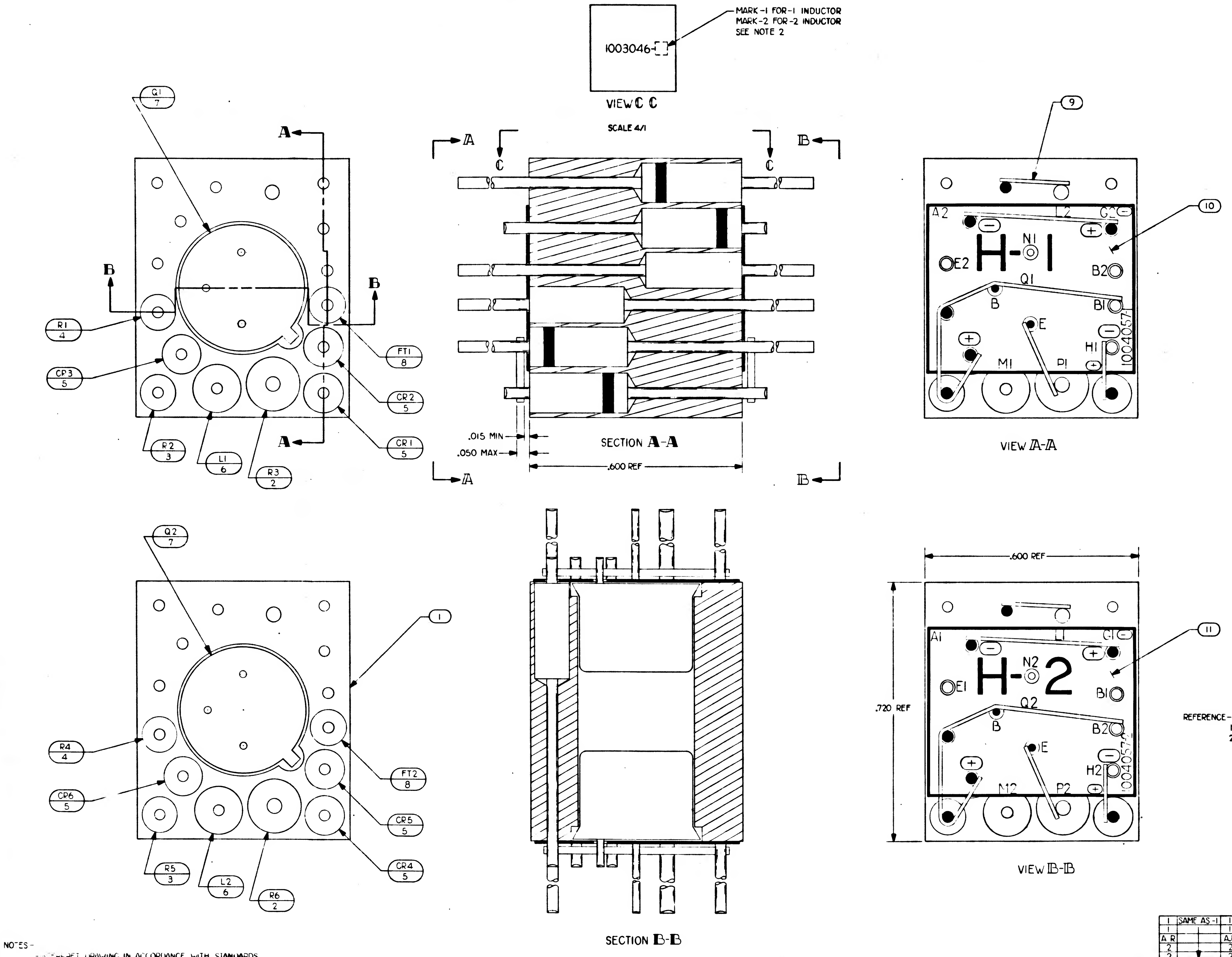
ASSEMBLY,
ARITHMETIC PULSE STICK

CODE IDENT NO.
SIZE E
NASA DRAWING NO 1003045
SCALE 2/1
WT
SHEET 1 OF 1

1003045

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00050 DATE 10-4-62

REFERENCE-
1-TEST IN ACCORDANCE WITH TEST SPEC ATP 1003046
2-SCHEMATIC DWG NO. 1006008

NOTES-
1-INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2-MARK 1/6 HIGH WHITE GOTHIC CHARACTERS AS SHOWN PER MIL-STD-130(STENCILED).
3-ALL WELDING PER ND 1002005.
4-● DENOTES LEADS TO BE CUT AFTER WELDING 1/32 MAX ABOVE WELD.

QTY REQ	IDENT NO.	QTY REQD	PART OR IDENTIFYING No.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	SAME AS -1	1	1004057-2	MYLAR FILM (BOTTOM)	11
1		1	1004057-1	MYLAR FILM (TOP)	10
A R		A.R.	1006757-1	.010 X .020 WIRE ELECTRICAL	9
2		2	2401794	TERMINAL FEEDTHRU	8
2		2	1006759	TRANSISTOR, NPN LOGIC	7
1	100679-2	1	100679-1	INDUCTOR, MINIATURE (TAB)(WEE WEE)	6
6	SAME AS -1	6	1006751	DIODE, SILICON LOGIC	5
2		2	1006750-45	RESISTOR, 1/4 WATT 680Ω	4
2		2	1006750-66	RESISTOR, 1/4 WATT 5.1K	3
2		2	1006760-7	RESISTOR, 1/2 WATT 18Ω	2
1		1	1004056	MODULE INJECTION MOULDING H-CIR	1
-2		-1	LIST OF MATERIALS		

1003041	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT
DRAWN Kalany DATE
CHECKED 10-1-62
APPROVAL
APPROVAL
NASA APPROVAL 10-4-62
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MODULE ASSEMBLY
H CIRCUIT
(TAB)

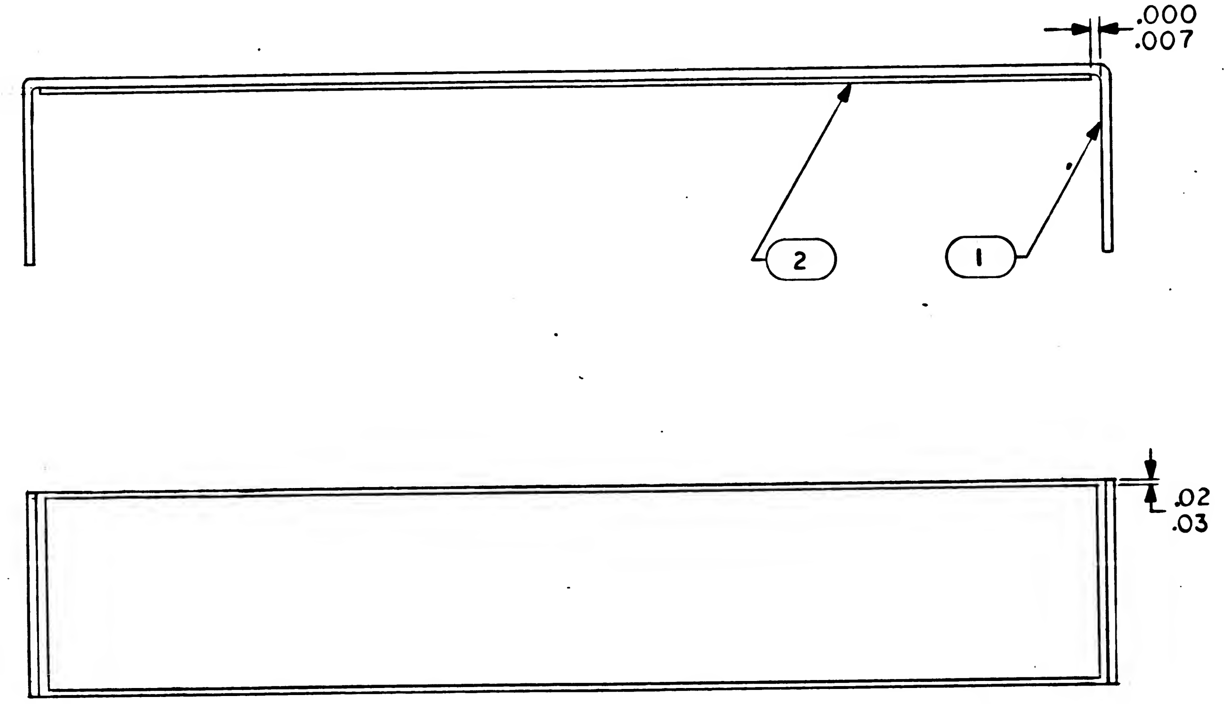
CODE IDENT NO
SIZE E
NASA DRAWING NO 1003046
SCALE 10/1
WT
SHEET 1 OF 1

1003046

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

1003058

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00896 **DATE** 4-17-63

COVER	PART NO.
1004078-1	1003058-1
1004078-2	1003058-2

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. BOND FIND NO. 2 TO FIND NO. 1 PER ND 1002004

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
1	1004081 -2	INSULATOR, MYLAR	2
1	SEE CHART	COVER	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003062	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT

DRAWN DATE 11-29-62
CHECKED 11APR63
APPROVAL 16 APR 63
APPROVAL
NASA APPROVAL
MIT APPROVAL 17 Apr 63

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HOUSTON, TEXAS

COVER AND INSULATOR ASSEMBLY

CODE IDENT NO.
SIZE C
NASA DRAWING NO. 1003058
SCALE 1/1
WT
SHEET 1 OF 1

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

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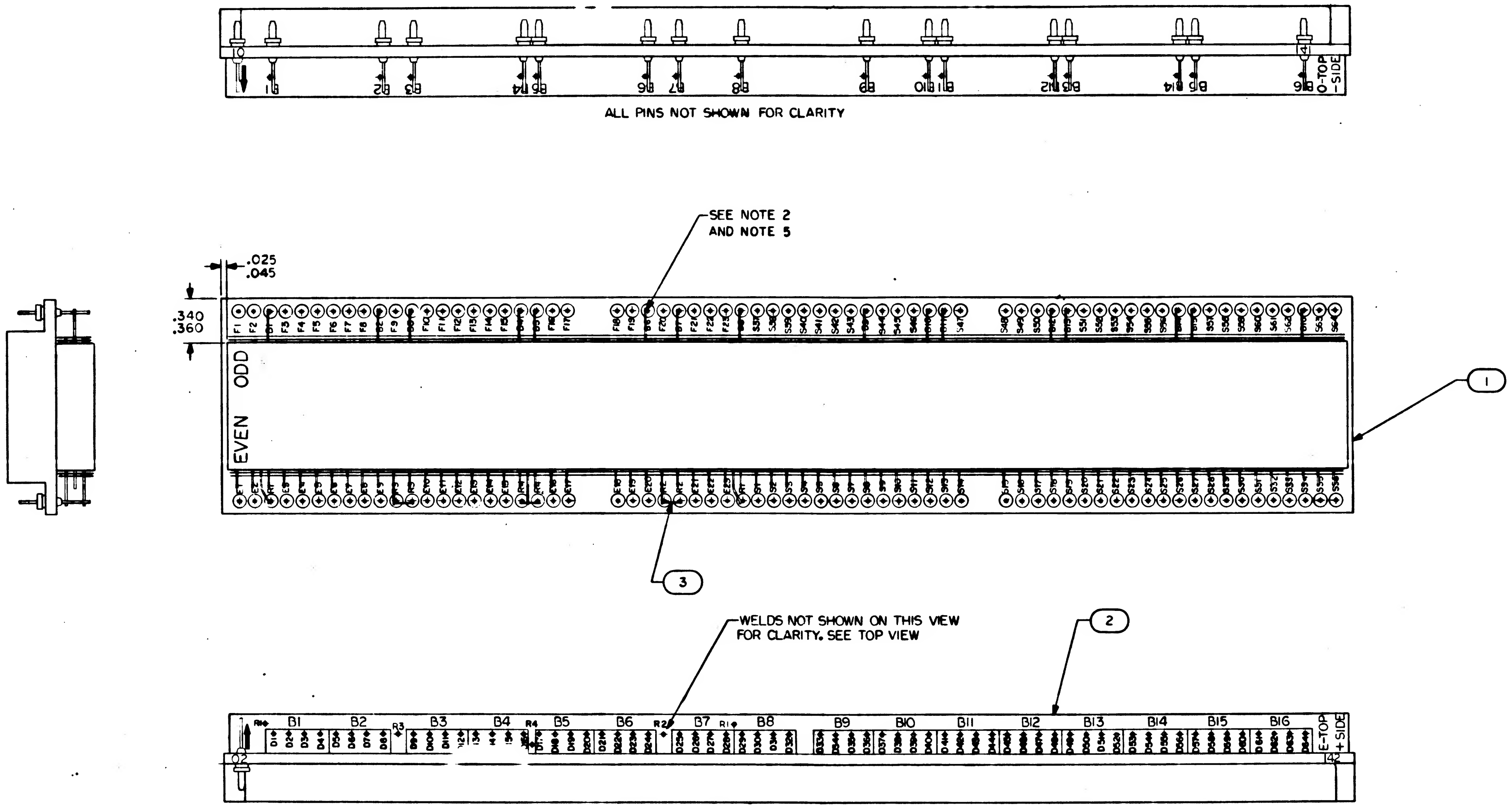
		REVISIONS	
SYM	DESCRIPTION	DATE	APPROVAL



ALL PINS NOT SHOWN FOR CLARITY
B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15 B16
O-TOP -SIDE
SEE NOTE 2 AND NOTE 5
.025
.045
.340
.360
ODD
EVEN
1
3
2
WELDS NOT SHOWN ON THIS VIEW FOR CLARITY. SEE TOP VIEW
E-TOP +SIDE

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00896 DATE 4-17-63

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005
3. BOND FIND NO. 2 TO FIND NO. 1 PER ND 1002004
4. AR DENOTES AS REQUIRED
5. CUT .010/.030 BEYOND WELD

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
☒	1006091	SCHEMATIC	REF
AR	1006757-1	WIRE, ELECTRICAL	3
1	1003067	DIODE BLOCK ASSEMBLY	2
1	1003078	HEADER ASSEMBLY	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003061	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT
DRAWN Mahoney DATE 11-30-62
CHECKED 11 APR 63
APPROVAL W B Turner 16 APR 63
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

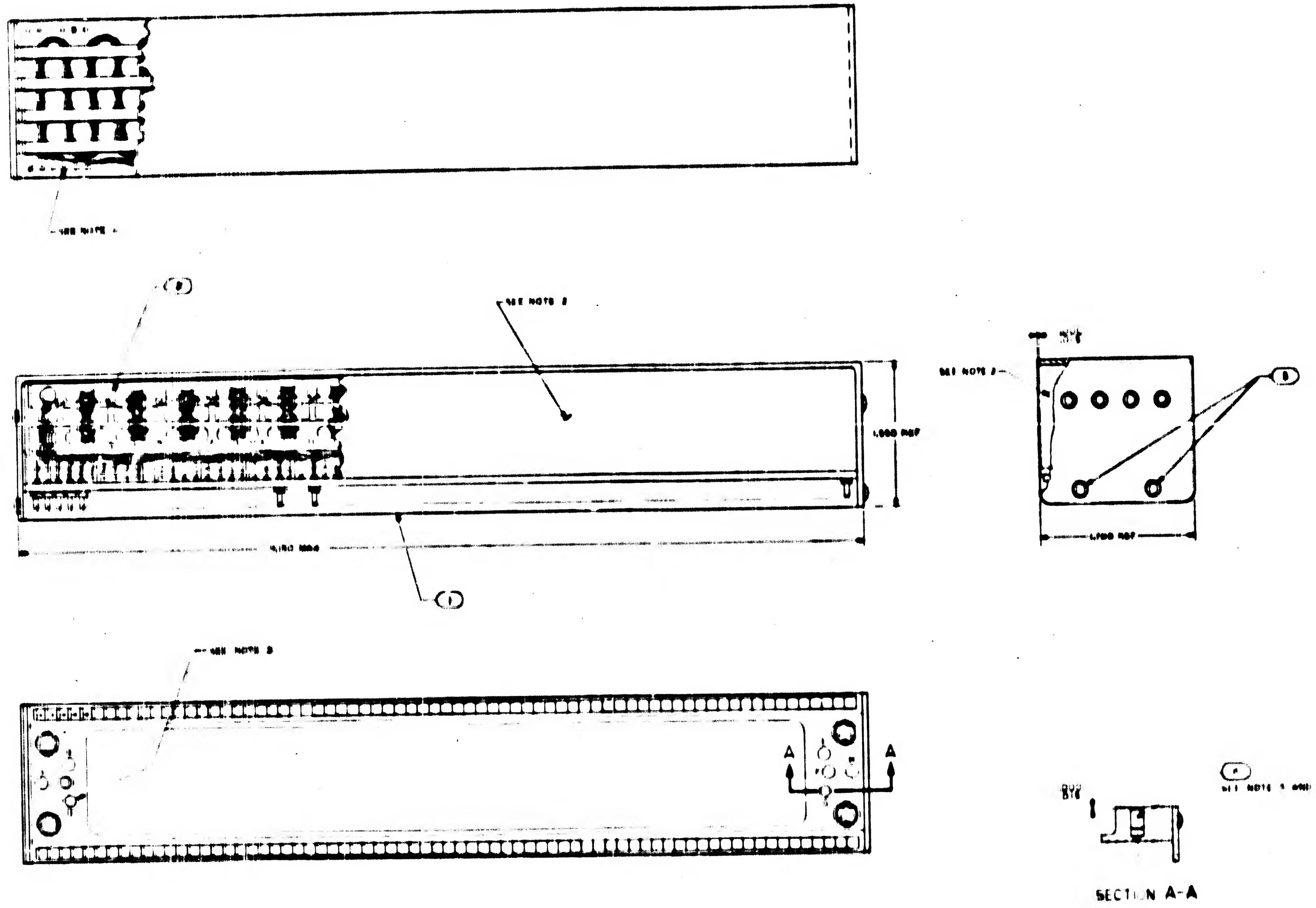
DIODE HEADER ASSEMBLY
ROPE MEMORY STICK

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003060
SCALE 2/1
WT
SHEET 1 OF 1

1003060

MASTER

INCHES
0 2
PHOTOGRAPHIC SCALE ONLY



FOR INFORMATION ONLY

DESCRIPTION	PART NO.	COVER AND CHANNEL SHIELD ASSEMBLY	KEY POSITIONS
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

ASSEMBLY

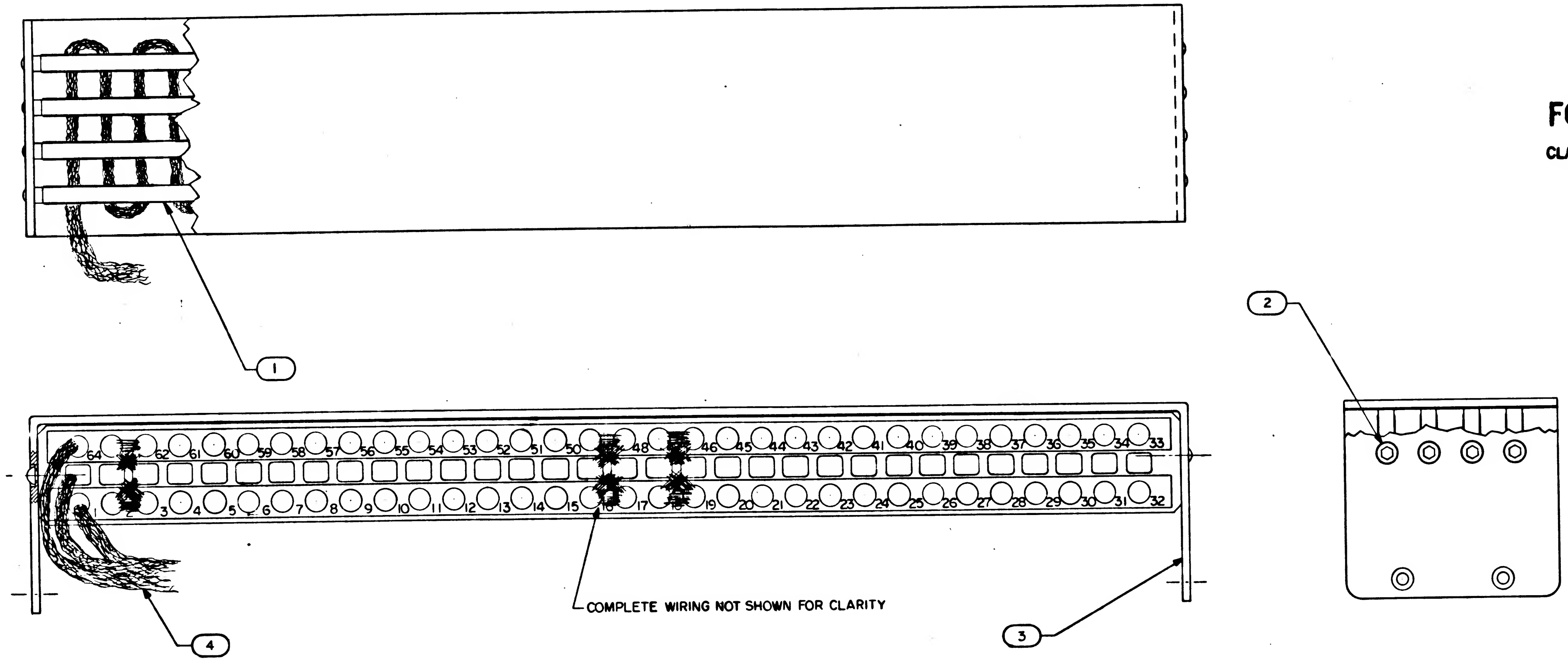
E 1003761

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00896 DATE 4-17-63



NOTES

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WIRE PER ND 1002120
3. COAT THREADS OF FIND NO. 2 WITH MIL-P-8585, WET ZINC CHROMATE PRIMER
4. AR DENOTES AS REQUIRED

DESCRIPTION	PART NO.
R1	1003062-1
R2	1003062-2
R3	1003062-3
R4	1003062-4
S1	1003062-5
S2	1003062-6
S3	1003062-7
S4	1003062-8
T1	1003062-9
T2	1003062-10
T3	1003062-11
T4	1003062-12

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
			REF
AR	ND1002116	WIRE, NO. 34	4
1	1003058-1	COVER AND INSULATOR ASSEMBLY	3
8	1000093-1	SCREW, BUTTON HEAD	2
4	1003065	ROPE CHANNEL ASSEMBLY	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003061	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO. CONTRACT
DRAWN Mahoney DATE 12-7-62
CHECKED R P Kinsbury 12APR63
APPROVAL W B Turner 16APR63
APPROVAL
NASA APPROVAL
MIT APPROVAL W Kupfer 17Apr

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HOUSTON, TEXAS

COVER AND CHANNEL WIRED ASSEMBLY

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003062
SCALE 2/1
WT
SHEET 1 OF 1

1003062

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

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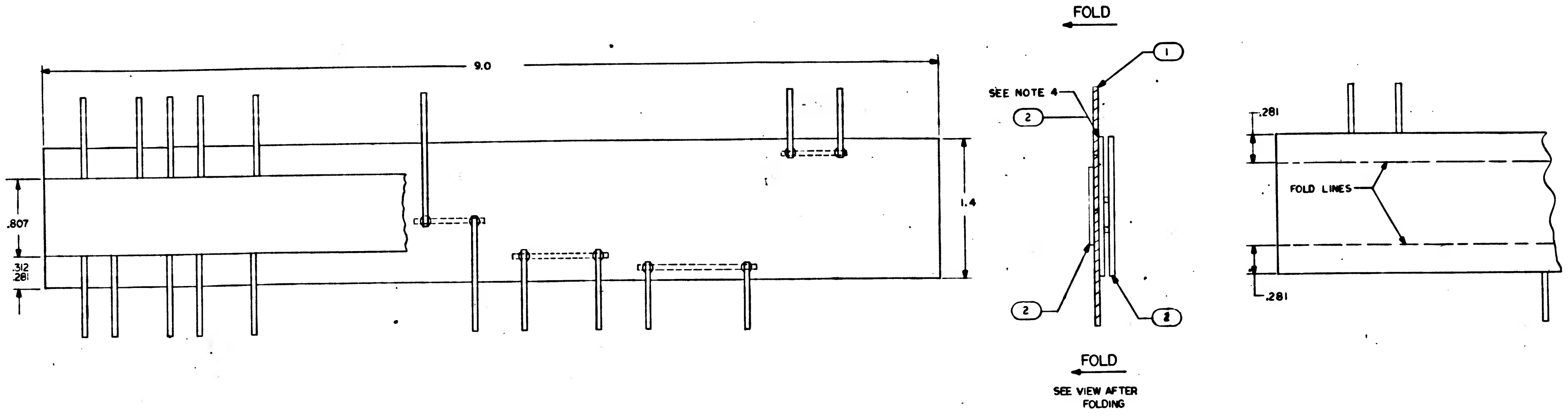
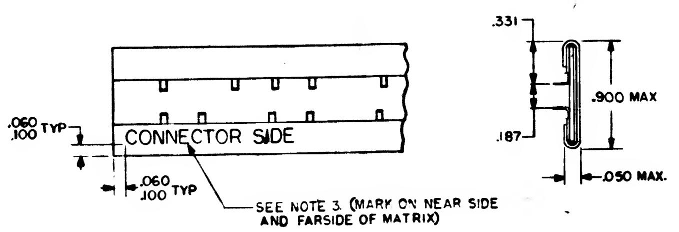
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISIED AND UPGRADED TO CLASS A PER TDRR 00901	11APR63	WST WK





VIEW OF MATRIX AFTER FOLDING

STICK IDENTIFICATION	WIRING MATRIX DIAGRAM	PART DASH NO [ODD]	PART DASH NO. [EVEN]
ARITHMETIC STICK C1-16	1006075	1003063-1	1003063-2

NOTES:—
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS BY MIL-D-70327
2. WELD PER ND 1002005
3. STENCIL 3/32 HIGH BLACK LETTERS AS SHOWN PER ND1002019
4. TAPE (FIND NO. 4) PROGRAMED PER

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1006806	TAPE, ADHESIVE	2
AR	1006757-7	005 X 020 WIRE, ELECTRICAL	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082	
1003081	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ±.010 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO CONTRACT
DRAWN Romereo DATE 12/7/62
CHECKED
APPROVAL 1-9-63
APPROVAL
NASA APPROVAL
MIT APPROVAL W Kupfer 30 Jan 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

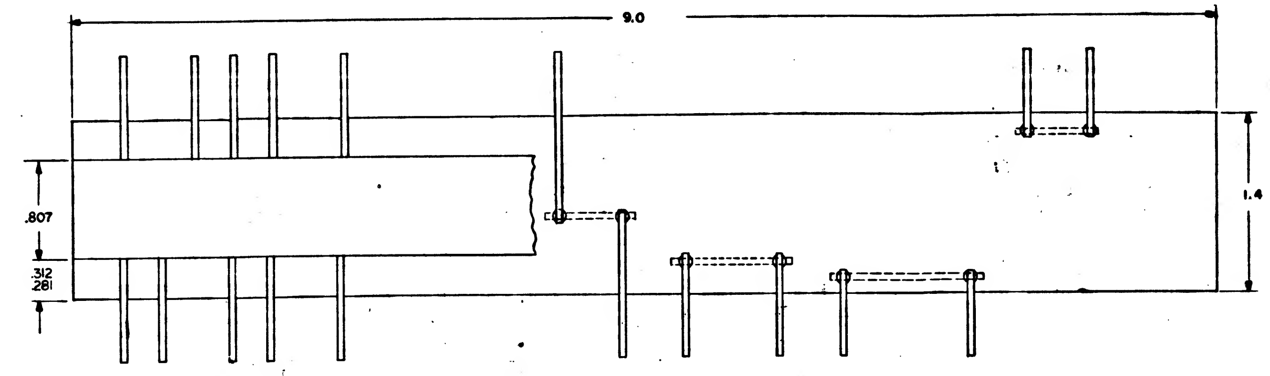
1400 MATRIX ASSEMBLY
STICK (TAB)

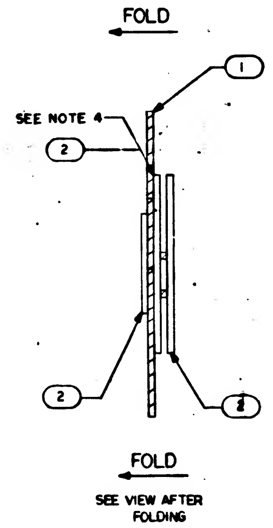
CODE IDENT NO
SIZE E
NASA DRAWING NO. 1003063
SCALE 2/1
WT
SHEET 1 OF 1

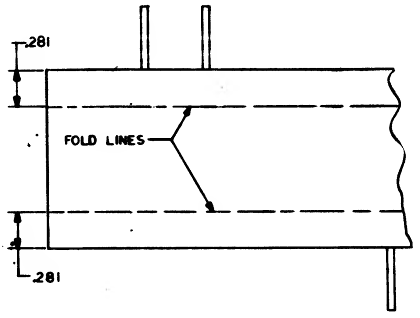
1003063 A

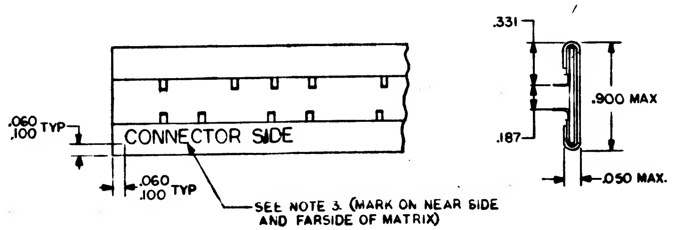
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISIED AND UPGRADED TO CLASS A PER TDRR 00[illegible]	[illegible] 63	WBT WK
B	REDRAWN / SUPERSEDED BY REVISION C WITH CHANGES PER TDRR 02219	[illegible]63	WBT 7/2/[illegible]









VIEW OF MATRIX AFTER FOLDING

STICK IDENTIFICATION	WIRING MATRIX DIAGRAM	PART DASH NO.[ODD]	PART DASH NO.[EVEN]
ARITHMETIC STICK C1-16	1006075	1003063-1	1003063-2

Ⓑ SUPERSEDED BY REV C

1003063 B

NOTES:—
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS BY MIL-D-70327
2. WELD PER ND 1002005
3. STENCIL 3/32 HIGH BLACK LETTERS AS SHOWN PER ND1002019
4. TAPE (FIND NO. 4) PROGRAMED PER

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1006806	TAPE, ADHESIVE	2
AR	1006757-7	.005 X .020 WIRE, ELECTRICAL	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082	
1003081	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ±.010 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO CONTRACT
DRAWN [illegible] DATE 12/7/62
CHECKED [illegible]
APPROVAL [illegible] 3/20/63
APPROVAL [illegible]
NASA APPROVAL [illegible]
MIT APPROVAL W Kupfer 20 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

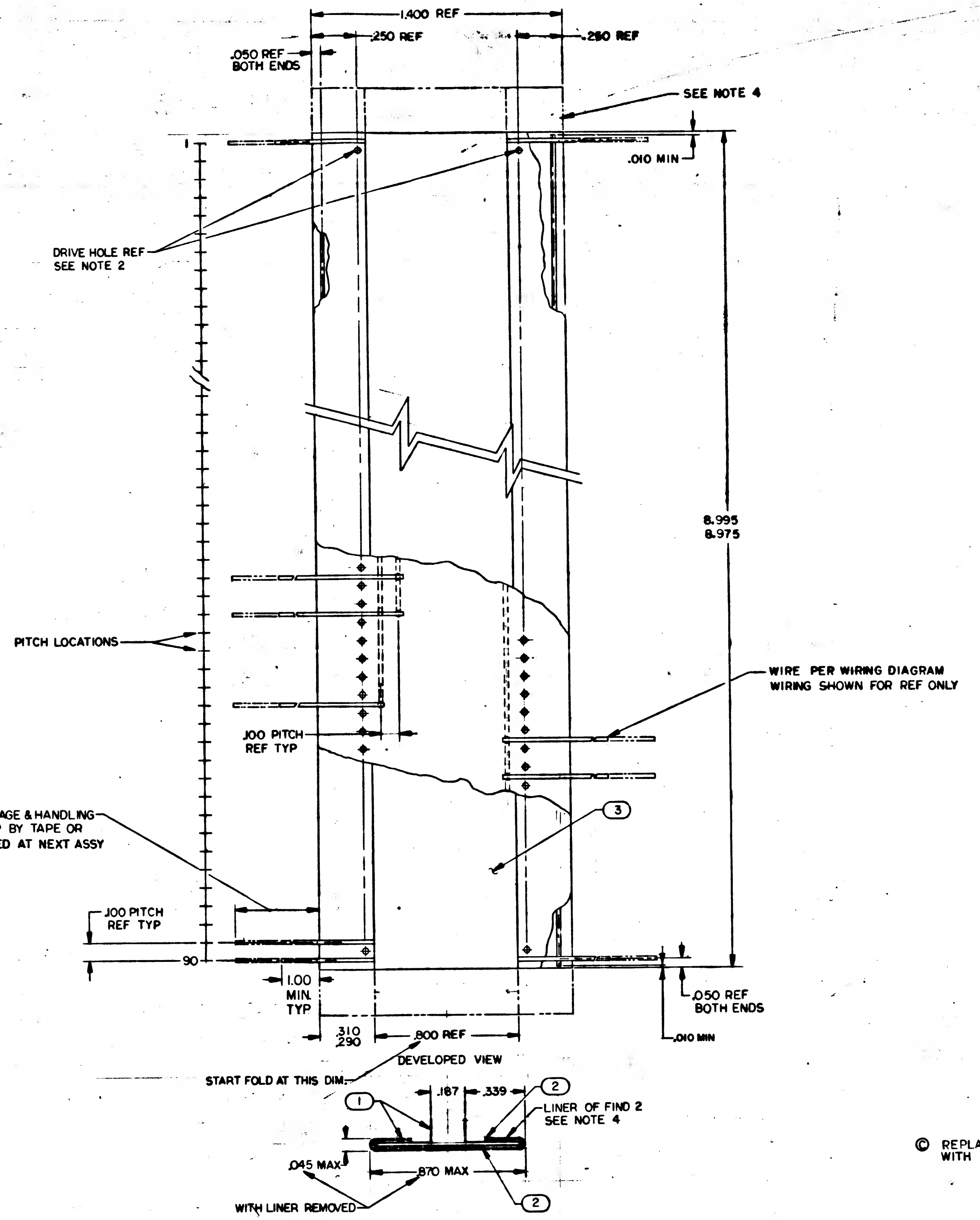
1.400 MATRIX ASSEMBLY
STICK (TAB)

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003063
SCALE 2/1
WT
SHEET 1 OF 1

INCHES
PHOTOGRAPHIC SCALE ONLY

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGE PER TDRR		

MODULE NUMBER	SIGNAL WIRING DIAG	PART NO. OF MATRIX 2 ON WIRING DIAG	PART NO. OF MATRIX 3 ON WIRING DIAG
A1-A16	1006120	1003063-1	1003063-2
A35			
A18	1006122	1003063-5	1003063-6
A17	1006123	1003063-7	1003063-8
A27			
A25			
A32			
A33-A34	1006127	1003063-15	1003063-16
A30-A31	1006128	1003063-17	1003063-18
A26			
A37			
A38	1006131	1003063-23	1003063-24
A28	1006132	1003063-25	1003063-26
A22	1006133	1003063-27	1003063-28
A23			
A24	1006135	1003063-31	1003063-32
A21	1006136	1003063-33	1003063-34
A36			
A29			



VIEW SHOWN INCOMPLETE FOR CLARITY

NOTES
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER ND 1002030
3. ✱ DENOTES LENGTH IN FEET
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY
5. AR DENOTES AS REQUIRED

Ⓒ REPLACES REV B WITH CHANGE

	QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
✱	1.0	1006806-8	INSULATION TAPE, ELECTRICAL	3
✱	2.0	1006806-2	INSULATION TAPE, ELECTRICAL	2
	AR	1006757-7	WIRE, ELECTRICAL .005 X .020	1

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ±.010 ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT
DRAWN DATE
CHECKED
APPROVAL
APPROVAL 7/24/63
NASA APPROVAL
MIT APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

1400 MATRIX ASSEMBLY

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003063
SCALE 4/1
WT
SHEET 1 OF 1

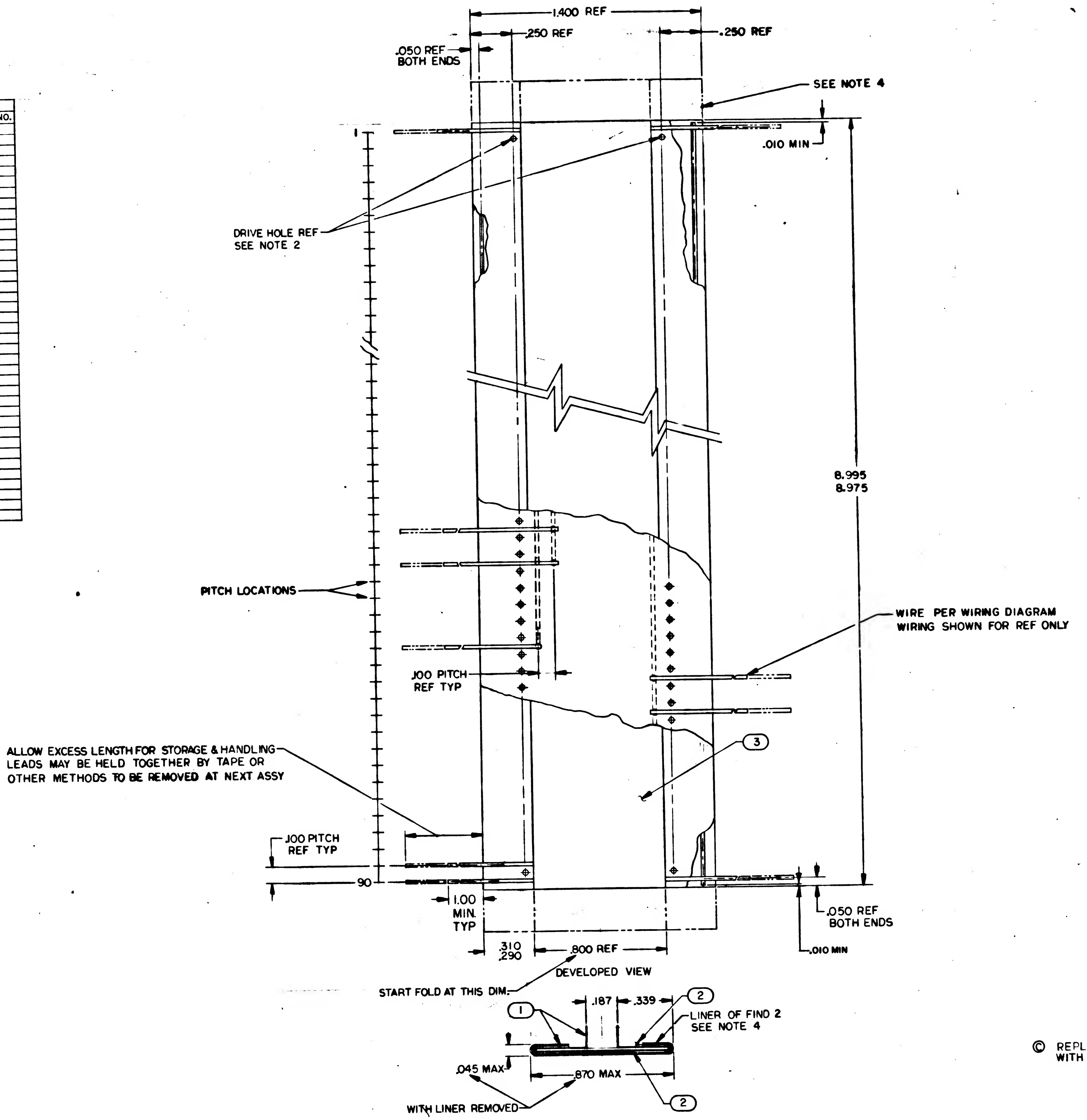
1003063 C

MASTER

INCHES
PHOTOGRAPHIC SCALE ONLY

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGE PER TDRR 02189	103263	
D	CHANGED PER TDRR 03127	9-18-63	

PART NO.	REV	SIGNAL WIRING DIAGRAM		
		DRAWING NO.	REV	MATRIX NO.
1003063-1		1006120		2
1003063-2		1006120		3
1003063-3		1006121		2
1003063-4		1006121		3
1003063-5		1006122		2
1003063-6		1006122		3
1003063-7		1006123		2
1003063-8		1006123		3
1003063-9		1006124		2
1003063-10		1006124		3
1003063-11		1006125		2
1003063-12		1006125		3
1003063-13		1006126		2
1003063-14		1006126		3
1003063-15		1006127		2
1003063-16		1006127		3
1003063-17		1006128		2
1003063-18		1006128		3
1003063-19		1006129		2
1003063-20		1006129		3
1003063-21		1006130		2
1003063-22		1006130		3
1003063-23		1006131		2
1003063-24		1006131		3
1003063-25		1006132		2
1003063-26		1006132		3
1003063-27		1006133		2
1003063-28		1006133		3
1003063-29		1006134		2
1003063-30		1006134		3
1003063-31		1006135		2
1003063-32		1006135		3
1003063-33		1006136		2
1003063-34		1006136		3
1003063-35		1006137		2
1003063-36		1006137		3
1003063-37		1006138		2
1003063-38		1006138		3



VIEW SHOWN INCOMPLETE FOR CLARITY

NOTES
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER ND 1002030
3. ✻ DENOTES LENGTH IN FEET
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY
5. AR DENOTES AS REQUIRED

Ⓒ REPLACES REV B WITH CHANGE

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
✻ 1.0	1006806-9	INSULATION TAPE, ELECTRICAL	3
✻ 2.0	1006806-2	INSULATION TAPE, ELECTRICAL	2
AR	1006757-7	WIRE, ELECTRICAL .005X.020	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ±.010 ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO CONTRACT
DRAWN J.A. DATE
CHECKED
APPROVAL
APPROVAL 7/31/62
NASA APPROVAL
MIT APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

1400 MATRIX ASSEMBLY
(TABULATED)

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003063
SCALE 4/1
WT
SHEET 1 OF 1

1003063 D

MASTER

INCHES
PHOTOGRAPHIC SCALE ONLY

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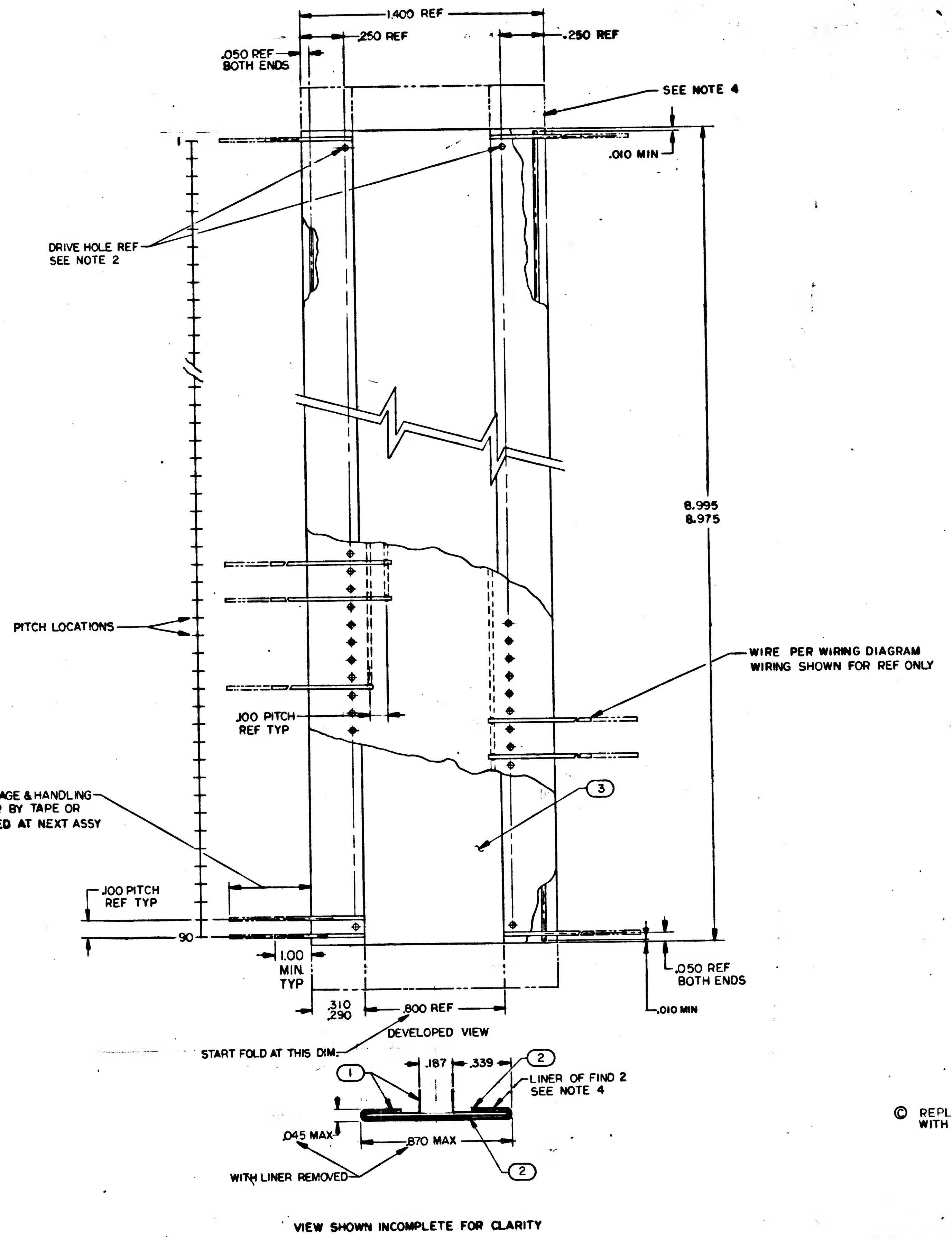
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGE PER TDRR 02289	20 JUNE 63	
D	CHANGED PER TDRR 03127	9-12-63	
E	REVISED PER TDRR 03436	9-26-63	

MODULE NO.	PART NO.	REV	SIGNAL WIRING DIAGRAM		
			DRAWING NO.	REV	MATRIX NO.
A1-A16	1003063-1		1006120		2
A1-A16	1003063-2		1006120		3
A35	1003063-3		1006121		2
A35	1003063-4		1006121		3
A18	1003063-5		1006122		2
A18	1003063-6		1006122		3
A17	1003063-7		1006123		2
A17	1003063-8		1006123		3
A27	1003063-9		1006124		2
A27	1003063-10		1006124		3
A23	1003063-11		1006125		2
A23	1003063-12		1006125		3
A32	1003063-13		1006126		2
A32	1003063-14		1006126		3
A33-A34	1003063-15		1006127		2
A33-A34	1003063-16		1006127		3
A30-A31	1003063-17		1006128		2
A30-A31	1003063-18		1006128		3
~~A26~~	~~1003063-19~~		~~1006129~~		~~2~~
A26	1003063-20		1006129		3
A37	1003063-21		1006130		2
A37	1003063-22		1006130		3
A38	1003063-23		1006131		2
A38	1003063-24		1006131		3
A28	1003063-25		1006132		2
A28	1003063-26		1006132		3
A22	1003063-27		1006133		2
A22	1003063-28		1006133		3
A25	1003063-29		1006134		2
A25	1003063-30		1006134		3
A24	1003063-31		1006135		2
A24	1003063-32		1006135		3
A21	1003063-33		1006136		2
A21	1003063-34		1006136		3
A36	1003063-35		1006137		2
A36	1003063-36		1006137		3
A29	1003063-37		1006139		2
A29	1003063-38		1008139		3
A26	1003063-39	E	1006129	A	2



NOTES
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER ND 1002030
3. * DENOTES LENGTH IN FEET
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY
5. AR DENOTES AS REQUIRED

© REPLACES REV B WITH CHANGE

	QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
*	1.0	1006806-9	INSULATION TAPE, ELECTRICAL	3
*	2.0	1006806-2	INSULATION TAPE, ELECTRICAL	2
	AR	1006757-7	WIRE, ELECTRICAL .005 X .020	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082-	
1003081-	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ±.010 ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS
DRAWN G.A. [illegible] DATE
CHECKED [illegible]
APPROVAL [illegible]
APPROVAL [illegible] 7/30/62
NASA APPROVAL [illegible]
MIT APPROVAL [illegible]
MIT APPROVAL [illegible]

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

1400 MATRIX ASSEMBLY
(TABULATED)

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003063
SCALE 4/1
WT
SHEET 1 OF 1

1003063 E

MASTER

INCHES
PHOTOGRAPHIC SCALE ONLY

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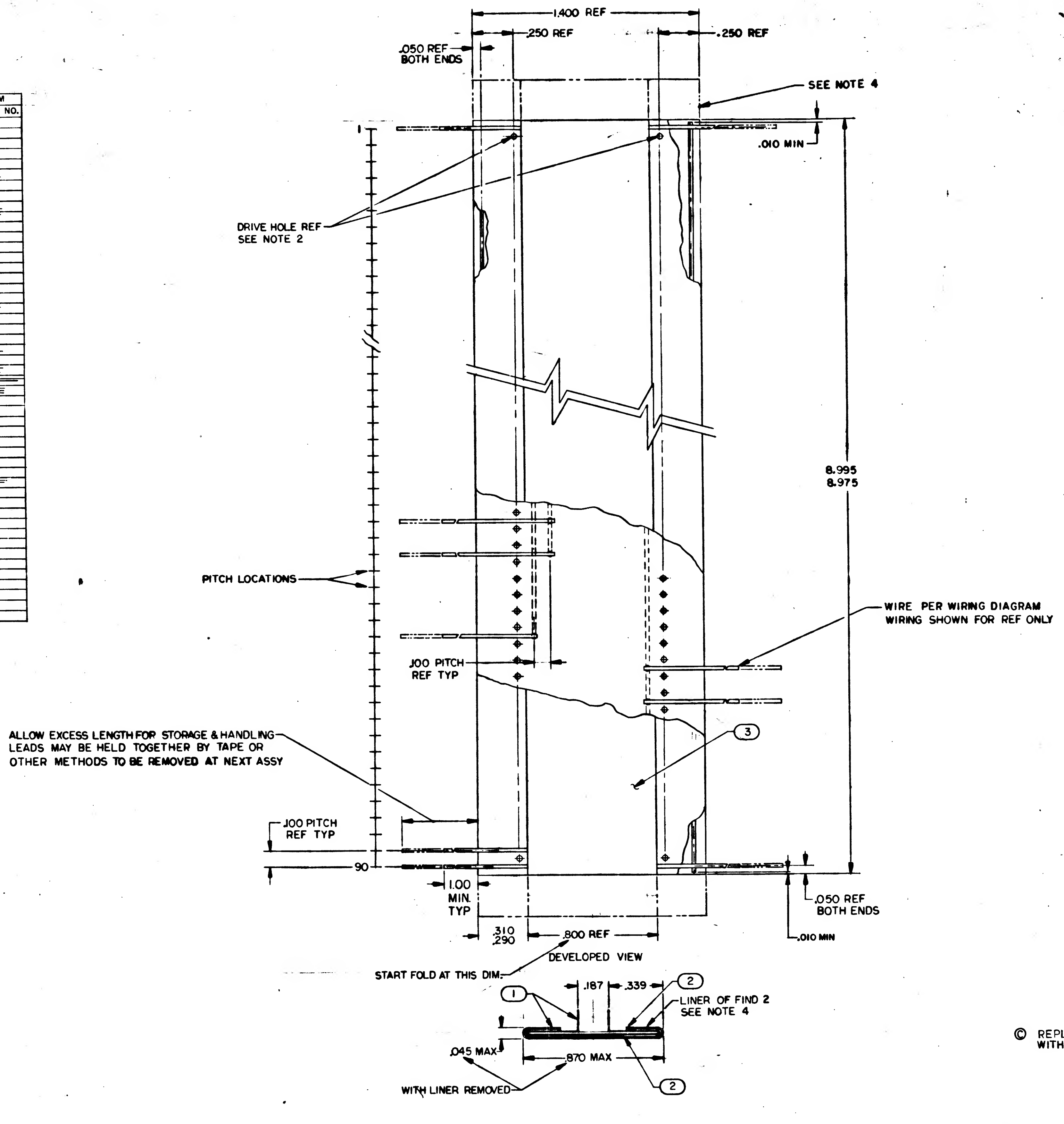
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGE PER TDRR 02209	20JUN63	
D	CHANGED PER TDRR 03127	9-13-63	WK
E	REVISED PER TDRR 03436	9-26-63	
F	REVISED PER TDRR 03587	10-2-63	WK

MODULE NO.	PART NO.	REV	SIGNAL WIRING DIAGRAM		
			DRAWING NO.	REV	MATRIX NO.
A1-A16	1003063-1		1006120		2
A1-A16	1003063-2		1006120		3
A35	1003063-3		1006121		2
A35	1003063-4		1006121		3
~~A18~~	~~1003063-5~~		~~1006122~~		~~2~~
~~A18~~	~~1003063-6~~		~~1006122~~		~~3~~
A17	1003063-7		1006123		2
A17	1003063-8		1006123		3
~~A27~~	~~1003063-9~~		~~1006124~~		~~2~~
~~A27~~	~~1003063-10~~		~~1006124~~		~~3~~
A23	1003063-11		1006125		2
A23	1003063-12		1006125		3
A32	1003063-13		1006126		2
A32	1003063-14		1006126		3
A33-A34	1003063-15		1006127		2
A33-A34	1003063-16		1006127		3
A30-A31	1003063-17		1006128		2
A30-A31	1003063-18		1006128		3
~~A26~~	~~1003063-19~~		~~1006129~~		~~2~~
A26	1003063-20		1006129		3
A37	1003063-21		1006130		2
A37	1003063-22		1006130		3
~~A38~~	~~1003063-23~~		~~1006131~~		~~2~~
A38	1003063-24		1006131		3
~~A28~~	~~1003063-25~~		~~1006132~~		~~2~~
~~A28~~	~~1003063-26~~		~~1006132~~		~~3~~
~~A22~~	~~1003063-27~~		~~1006133~~		~~2~~
A22	1003063-28		1006133		3
A25	1003063-29		1006134		2
A25	1003063-30		1006134		3
A24	1003063-31		1006135		2
A24	1003063-32		1006135		3
A21	1003063-33		1006136		2
A21	1003063-34		1006136		3
A36	1003063-35		1006137		2
~~A36~~	~~1003063-36~~		~~1006137~~		~~3~~
A29	1003063-37		1006139		2
A29	1003063-38		1006139		3
A26	1003063-39	E	1006129	A	2
A36	1003063-40	F	1006137	A	3
A18	1003063-41	F	1006122	A	2
A18	1003063-42	F	1006122	A	3
A22	1003063-43	F	1006133	A	2
A38	1003063-44	F	1006131	B	2
A27	1003063-45	F	1006124	A	2
A27	1003063-46	F	1006124	A	3
A28	1003063-47	F	1006132	A	2
A28	1003063-48	F	1006132	A	3



VIEW SHOWN INCOMPLETE FOR CLARITY

© REPLACES REV B WITH CHANGE

NOTES
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER ND 1002030
3. * DENOTES LENGTH IN FEET
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY
5. AR DENOTES AS REQUIRED

	QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
*	1.0	1006806-9	INSULATION TAPE, ELECTRICAL	3
*	2.0	1006806-2	INSULATION TAPE, ELECTRICAL	2
	AR	1006757-7	WIRE, ELECTRICAL .005 X .020	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082-	
1003081-	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ±.010 ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT
DRAWN J.A. Bliss DATE 6/1963
CHECKED 6 June 63
APPROVAL
APPROVAL 7/26/63
NASA APPROVAL
MIT APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

1400 MATRIX ASSEMBLY (TABULATED)

CODE IDENT NO. —
SIZE E
NASA DRAWING NO 1003063
SCALE 4/1
WT
SHEET 1 OF 1

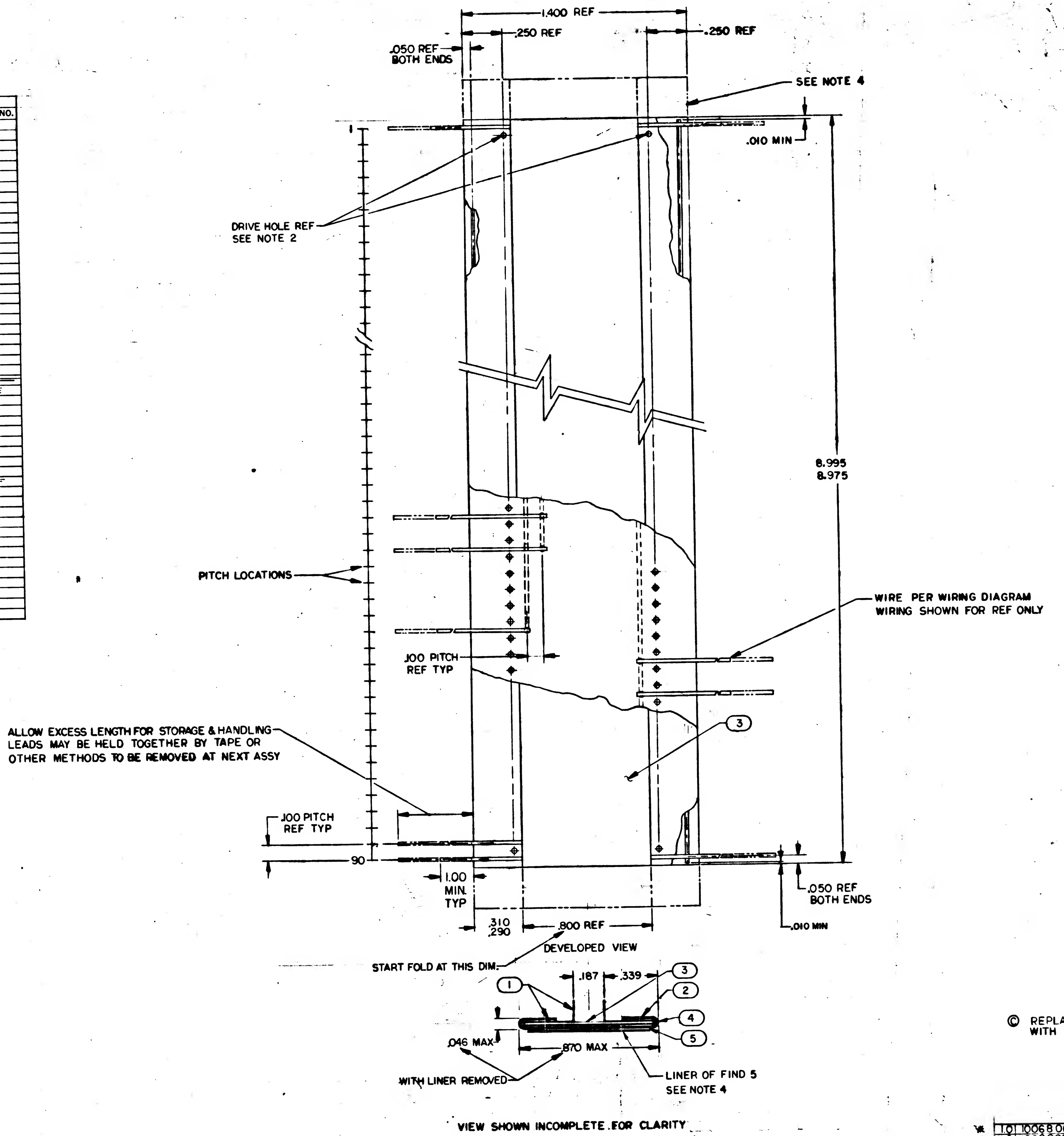
1003063E

MASTER

NOTICE [illegible]

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGE PER TDRR 02289	30JUL63	
D	CHANGED PER TDRR 03121	9-12-63	
E	REVISED PER TDRR 03436	9-26-63	
F	REVISED PER TDRR 03587	10-3-63	
G	REVISED PER TDRR 04006	10-17-63	W.C

MODULE NO.	PART NO.	REV	SIGNAL WIRING DIAGRAM		
			DRAWING NO.	REV	MATRIX NO.
A1-A16	1003063-1	G	1006120		2
A1-A16	1003063-2	G	1006120		3
A35	1003063-3	G	1006121		2
A35	1003063-4	G	1006121		3
~~A18~~	~~1003063-5~~		~~1006122~~		~~2~~
~~A18~~	~~1003063-6~~		~~1006122~~		~~3~~
A17	1003063-7	G	1006123		2
A17	1003063-8	G	1006123		3
~~A27~~	~~1003063-9~~		~~1006124~~		~~2~~
~~A27~~	~~1003063-10~~		~~1006124~~		~~3~~
A23	1003063-11	G	1006125		2
A23	1003063-12	G	1006125		3
A32	1003063-13	G	1006126		2
A32	1003063-14	G	1006126		3
A33-A34	1003063-15	G	1006127		2
A33-A34	1003063-16	G	1006127		3
A30-A31	1003063-17	G	1006128		2
A30-A31	1003063-18	G	1006128		3
~~A26~~	~~1003063-19~~	G	~~1006129~~		~~2~~
A26	1003063-20	G	1006129		3
A37	1003063-21	G	1006130		2
A37	1003063-22	G	1006130		3
~~A38~~	~~1003063-23~~		~~1006131~~		~~2~~
A38	1003063-24	G	1006131		3
~~A28~~	~~1003063-25~~		~~1006132~~		~~2~~
~~A28~~	~~1003063-26~~		~~1006132~~		~~3~~
~~A22~~	~~1003063-27~~		~~1006133~~		~~2~~
A22	1003063-28	G	1006133		3
A25	1003063-29	G	1006134		2
A25	1003063-30	G	1006134		3
A24	1003063-31	G	1006135		2
A24	1003063-32	G	1006135		3
A21	1003063-33	G	1006136		2
A21	1003063-34	G	1006136		3
A36	1003063-35	G	1006137		2
~~A36~~	~~1003063-36~~		~~1006137~~		~~3~~
A29	1003063-37	G	1006139		2
A29	1003063-38	G	1006139		3
A26	1003063-39	G	1006129	A	2
A36	1003063-40	G	1006137	A	3
A18	1003063-41	G	1006122	A	2
A18	1003063-42	G	1006122	A	3
A22	1003063-43	G	1006133	A	2
A38	1003063-44	G	1006131	B	2
A27	1003063-45	G	1006124	A	2
A27	1003063-46	G	1006124	A	3
A28	1003063-47	G	1006132	A	2
A28	1003063-48	G	1006132	A	3



NOTES
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER ND 1002030
3. ✱ DENOTES LENGTH IN FEET
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY
5. AR DENOTES AS REQUIRED

Ⓒ REPLACES REV B WITH CHANGE

	QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
✱	1.0	1006806-1	INSULATION TAPE ELECTRICAL	5
✱	1.0	1006806-12	INSULATION TAPE ELECTRICAL	4
✱	1.0	1006806-9	INSULATION TAPE, ELECTRICAL	3
✱	1.0	1006806-2	INSULATION TAPE, ELECTRICAL	2
	AR	1006757-7	WIRE, ELECTRICAL .005X.020	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082-	
1003081-	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ±.010 ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT
DRAWN J.A. Biffin DATE
CHECKED 6 June 63
APPROVAL
APPROVAL 7/26/63
NASA APPROVAL
MIT APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

1400 MATRIX ASSEMBLY (TABULATED)

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003063
SCALE 4/1
WT
SHEET 1 OF 1

MASTER

INCHES
PHOTOGRAPHIC SCALE ONLY

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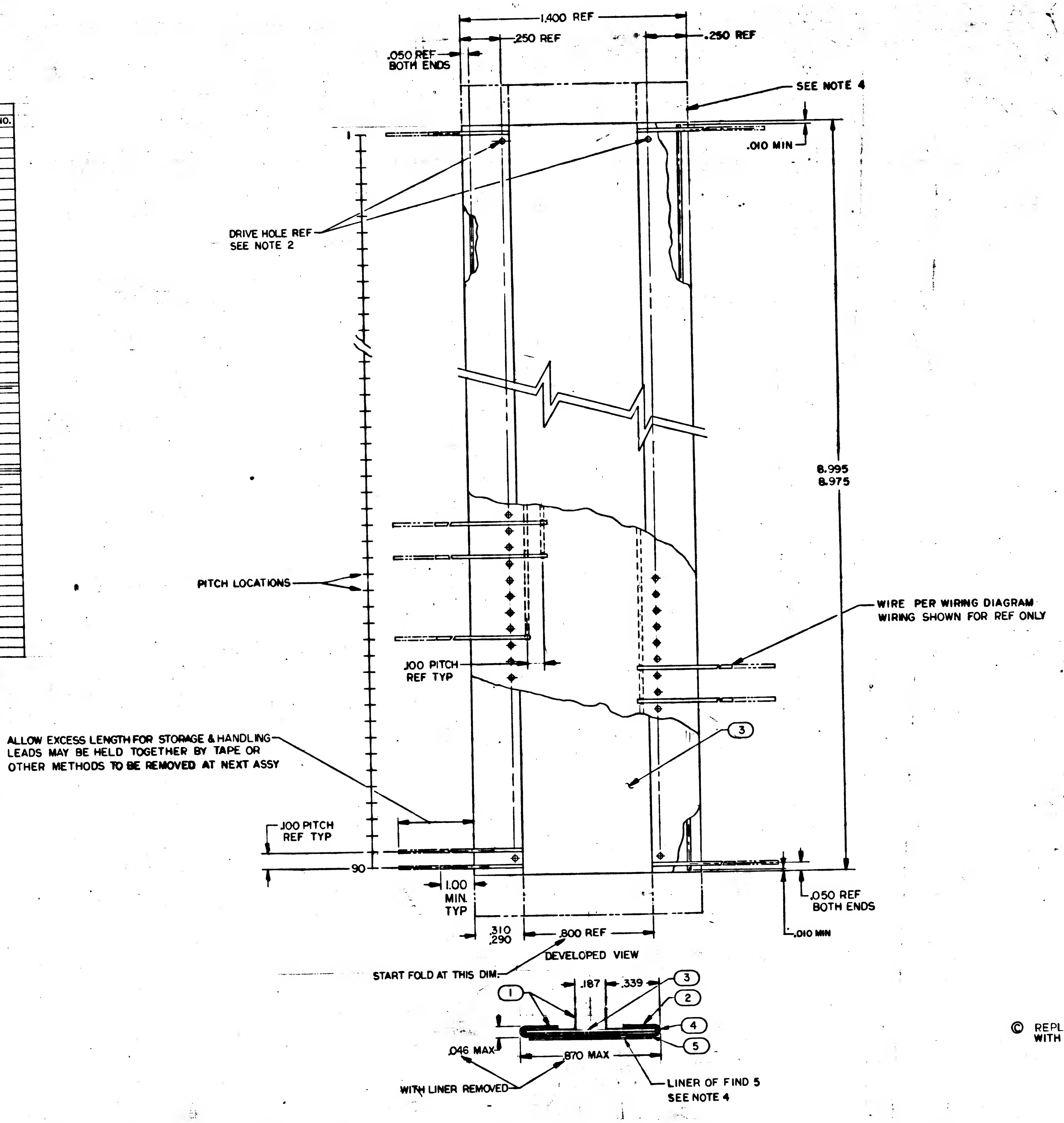
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGE PER TDRR [illegible]	[illegible]	
D	CHANGED PER TDRR 03127	9-13-63	
E	REVISED PER TDRR 03436	9-26-63	
F	REVISED PER TDRR 03587	10-3-63	
G	REVISED PER TDRR 04006	10-17-63	
H	REVISED PER TDRR 06315	3/11/64	

MODULE NO.	PART NO.	REV	SIGNAL WIRING DIAGRAM		
			DRAWING NO.	REV	MATRIX NO.
A1-A16	1003063-1	G	1006120		2
A1-A16	1003063-2	G	1006120		3
A35	1003063-3	G	1006121		2
A35	1003063-4	G	1006121		3
~~A18~~	~~1003063-5~~		~~1006122~~		~~2~~
~~A18~~	~~1003063-6~~		~~1006122~~		~~3~~
A17	1003063-7	G	1006123		2
A17	1003063-8	G	1006123		3
~~A27~~	~~1003063-9~~		~~1006124~~		~~2~~
~~A27~~	~~1003063-10~~		~~1006124~~		~~3~~
A23	1003063-11	G	1006125		2
A23	1003063-12	G	1006125		3
A32	1003063-13	G	1006126		2
A32	1003063-14	G	1006126		3
A33-A34	1003063-15	G	1006127		2
A33-A34	1003063-16	G	1006127		3
A30-A31	1003063-17	G	1006128		2
A30-A31	1003063-18	G	1006128		3
~~A26~~	~~1003063-19~~	G	~~1006129~~		~~2~~
A26	1003063-20	G	1006129		3
A37	1003063-21	G	1006130		2
A37	1003063-22	G	1006130		3
~~A38~~	~~1003063-23~~		~~1006131~~		~~2~~
A38	1003063-24	G	1006131		3
~~A28~~	~~1003063-25~~		~~1006132~~		~~2~~
~~A28~~	~~1003063-26~~		~~1006132~~		~~3~~
~~A22~~	~~1003063-27~~		~~1006133~~		~~2~~
A22	1003063-28	G	1006133		3
A25	1003063-29	G	1006134		2
A25	1003063-30	G	1006134		3
A24	1003063-31	G	1006135		2
A24	1003063-32	G	1006135		3
A21	1003063-33	G	1006136		2
~~A21~~	~~1003063-34~~	~~G~~	~~1006136~~		~~3~~
A36	1003063-35	G	1006137		2
~~A36~~	~~1003063-36~~		~~1006137~~		~~3~~
A29	1003063-37	G	1006139		2
A29	1003063-38	G	1006139		3
A26	1003063-39	G	1006129	A	2
A36	1003063-40	G	1006137	A	3
A18	1003063-41	G	1006122	A	2
A18	1003063-42	G	1006122	A	3
A22	1003063-43	G	1006133	A	2
A38	1003063-44	G	1006131	B	2
A27	1003063-45	G	1006124	A	2
A27	1003063-46	G	1006124	A	3
A28	1003063-47	G	1006132	A	2
A28	1003063-48	G	1006132	A	3
A21	1003063-49	H	1006136	B	3



VIEW SHOWN INCOMPLETE FOR CLARITY

NOTES
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER ND 1002030
3. * DENOTES LENGTH IN FEET
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY
5. AR DENOTES AS REQUIRED

© REPLACES REV B WITH CHANGE

	QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
*	1.0	1006806-1	INSULATION TAPE ELECTRICAL	5
*	1.0	1006806-12	INSULATION TAPE ELECTRICAL	4
*	1.0	1006806-9	INSULATION TAPE, ELECTRICAL	3
*	1.0	1006806-2	INSULATION TAPE, ELECTRICAL	2
	AR	1006757-7	WIRE, ELECTRICAL .005X.020	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082-	
1003081-	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ±.010 ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO
CONTRACT
DRAWN
DATE
CHECKED
APPROVAL
APPROVAL 7/31/63
NASA APPROVAL
MIT APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

1400 MATRIX ASSEMBLY
(TABULATED)

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003063
SCALE 4/1
WT
SHEET 1 OF 1

1003063 H

MASTER

INCHES 0 1 2 PHOTOGRAPHIC SCALE ONLY

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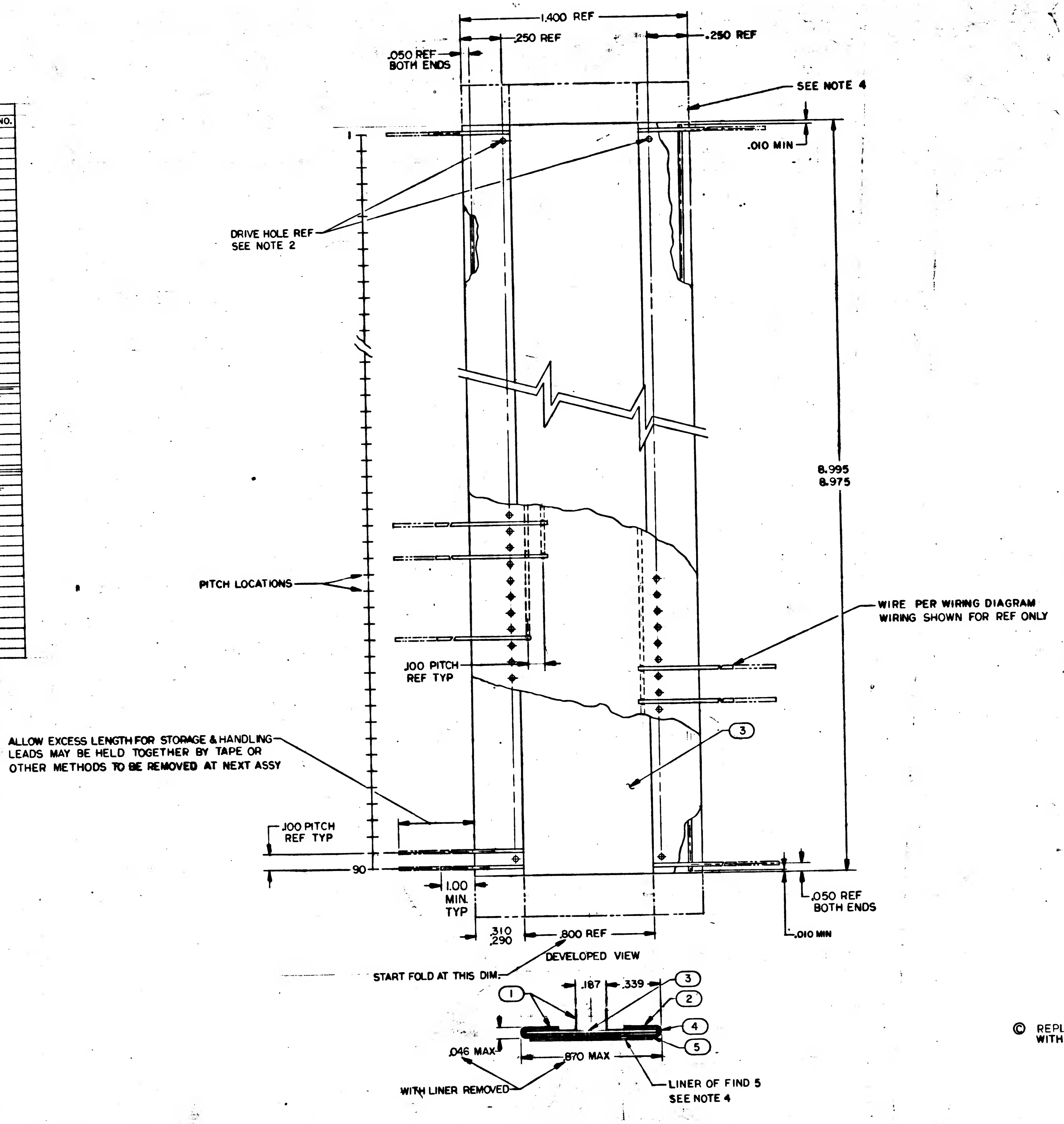
MODULE NO.	PART NO.	REV	SIGNAL WIRING DIAGRAM		
			DRAWING NO.	REV	MATRIX NO.
A1-A16	1003063-1	G	1006120		2
A1-A16	1003063-2	G	1006120		3
A35	1003063-3	G	1006121		2
A35	1003063-4	G	1006121		3
~~A18~~	~~1003063-5~~		~~1006122~~		~~2~~
~~A18~~	~~1003063-6~~		~~1006122~~		~~3~~
A17	1003063-7	G	1006123		2
A17	1003063-8	G	1006123		3
~~A27~~	~~1003063-9~~		~~1006124~~		~~2~~
~~A27~~	~~1003063-10~~		~~1006124~~		~~3~~
A23	1003063-11	G	1006125		2
A23	1003063-12	G	1006125		3
A32	1003063-13	G	1006126		2
A32	1003063-14	G	1006126		3
A33-A34	1003063-15	G	1006127		2
A33-A34	1003063-16	G	1006127		3
A30-A31	1003063-17	G	1006128		2
A30-A31	1003063-18	G	1006128		3
~~A26~~	~~1003063-19~~	G	~~1006129~~		~~2~~
A26	1003063-20	G	1006129		3
A37	1003063-21	G	1006130		2
A37	1003063-22	G	1006130		3
~~A38~~	~~1003063-23~~		~~1006131~~		~~2~~
A38	1003063-24	G	1006131		3
~~A28~~	~~1003063-25~~		~~1006132~~		~~2~~
~~A28~~	~~1003063-26~~		~~1006132~~		~~3~~
~~A22~~	~~1003063-27~~		~~1006133~~		~~2~~
A22	1003063-28	G	1006133		3
A25	1003063-29	G	1006134		2
A25	1003063-30	G	1006134		3
A24	1003063-31	G	1006135		2
A24	1003063-32	G	1006135		3
A21	1003063-33	G	1006136		2
~~A21~~	~~1003063-34~~	~~G~~	~~1006136~~		~~3~~
A36	1003063-35	G	1006137		2
~~A36~~	~~1003063-36~~		~~1006137~~		~~3~~
A29	1003063-37	G	1006139		2
A29	1003063-38	G	1006139		3
A26	1003063-39	G	1006129	A	2
A36	1003063-40	G	1006137	A	3
A18	1003063-41	G	1006122	A	2
A18	1003063-42	G	1006122	A	3
A22	1003063-43	G	1006133	A	2
A38	1003063-44	G	1006131	B	2
A27	1003063-45	G	1006124	A	2
A27	1003063-46	G	1006124	A	3
A28	1003063-47	G	1006132	A	2
A28	1003063-48	G	1006132	A	3
A21	1003063-49	H	1006136	B	3

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGE PER TDRR 02219	10-12-63	
D	CHANGED PER TDRR 03127	9-18-63	WK
E	REVISED PER TDRR 03436	9-26-63	WK
F	REVISED PER TDRR 03587	10-3-63	WK
G	REVISED PER TDRR 04006	10-17-63	WK
H	REVISED PER TDRR 06315		



VIEW SHOWN INCOMPLETE FOR CLARITY

NOTES
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER ND 1002030
3. * DENOTES LENGTH IN FEET
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY
5. AR DENOTES AS REQUIRED

Ⓒ REPLACES REV B WITH CHANGE

LIST OF MATERIALS

	QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
*	1.0	1006806-1	INSULATION TAPE ELECTRICAL	5
*	1.0	1006806-12	INSULATION TAPE ELECTRICAL	4
*	1.0	1006806-9	INSULATION TAPE, ELECTRICAL	3
*	1.0	1006806-2	INSULATION TAPE, ELECTRICAL	2
	AR	1006757-7	WIRE, ELECTRICAL .005X.020	1

NEXT ASSY	USED ON
1003082-	
1003081-	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ±.010 ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO
CONTRACT
DRAWN
DATE
CHECKED
APPROVAL
APPROVAL 7/31/63
NASA APPROVAL
MIT APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

1400 MATRIX ASSEMBLY
(TABULATED)

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003063
SCALE 4/1
WT
SHEET 1 OF 1

1003063 H

MASTER

INCHES
0 1
PHOTOGRAPHIC SCALE ONLY

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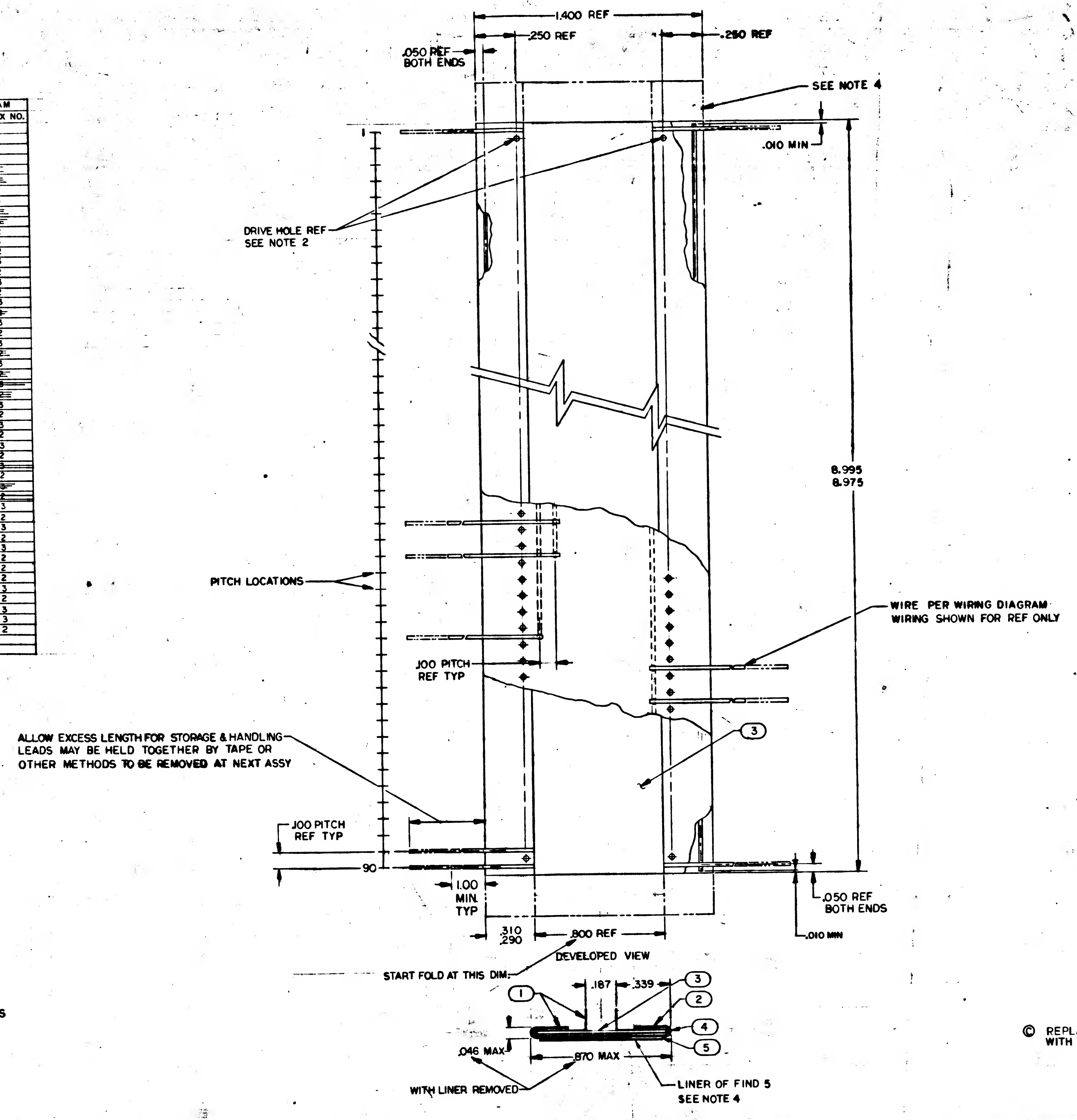
MODULE NO.	PART NO.	REV	SIGNAL WIRING DIAGRAM		
			DRAWING NO.	REV	MATRIX NO.
A1-A16	1003063-1	G	1006120		2
A1-A16	1003063-2	G	1006120		3
A35	1003063-3	G	1006121		2
A35	1003063-4	G	1006121		3
~~A18~~	~~1003063-5~~		~~1006122~~		~~2~~
~~A18~~	~~1003063-6~~		~~1006122~~		~~3~~
A17	1003063-7	G	1006123		2
A17	1003063-8	G	1006123		3
~~A27~~	~~1003063-9~~		~~1006124~~		~~2~~
~~A27~~	~~1003063-10~~		~~1006124~~		~~3~~
A23	1003063-11	G	1006125		2
A23	1003063-12	G	1006125		3
A32	1003063-13	G	1006126		2
A32	1003063-14	G	1006126		3
A33-A34	1003063-15	G	1006127		2
A33-A34	1003063-16	G	1006127		3
A30-A31	1003063-17	G	1006128		2
A30-A31	1003063-18	G	1006128		3
~~A26~~	~~1003063-19~~	G	~~1006129~~		~~2~~
A26	1003063-20	G	1006129		3
A37	1003063-21	G	1006130		2
A37	1003063-22	G	1006130		3
~~A38~~	~~1003063-23~~		~~1006131~~		~~2~~
A38	1003063-24	G	1006131		3
~~A28~~	~~1003063-25~~		~~1006132~~		~~2~~
~~A28~~	~~1003063-26~~		~~1006132~~		~~3~~
~~A22~~	~~1003063-27~~		~~1006133~~		~~2~~
A22	1003063-28	G	1006133		3
A25	1003063-29	G	1006134		2
A25	1003063-30	G	1006134		3
A24	1003063-31	G	1006135		2
A24	1003063-32	G	1006135		3
A21	1003063-33	G	1006136		2
~~A21~~	~~1003063-34~~	~~G~~	~~1006136~~		~~3~~
A36	1003063-35	G	1006137		2
~~A36~~	~~1003063-36~~		~~1006137~~		~~3~~
~~A29~~	~~1003063-37~~	~~G~~	~~1006139~~		~~2~~
A29	1003063-38	G	1006139		3
A26	1003063-39	G	1006129	A	2
A36	1003063-40	G	1006137	A	3
A18	1003063-41	G	1006122	A	2
A18	1003063-42	G	1006122	A	3
A22	1003063-43	G	1006133	A	2
A38	1003063-44	G	1006131	B	2
A27	1003063-45	G	1006124	A	2
A27	1003063-46	G	1006124	A	3
A28	1003063-47	G	1006132	A	2
A28	1003063-48	G	1006132	A	3
A21	1003063-49	H	1006136	B	3
A29	1003063-50	J	1006139	B	2

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGE PER TDRR 02204	30 JUL 63	
D	CHANGED PER TDRR 03127	8-22-63	WK
E	REVISED PER TDRR 03436	9-26-63	
F	REVISED PER TDRR 03587	10-3-63	WK
G	REVISED PER TDRR 04006	10-17-63	WK
H	REVISED PER TDRR 06315	2/11/64	
J	REVISED PER TDRR 06750	3/3/64	



DEVELOPED VIEW

VIEW SHOWN INCOMPLETE FOR CLARITY

NOTES
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER ND 1002030
3. ✱ DENOTES LENGTH IN FEET
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY
5. AR DENOTES AS REQUIRED

© REPLACES REV B WITH CHANGE

	QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
✱	1.0	1006806-1	INSULATION TAPE ELECTRICAL	5
✱	1.0	1006806-12	INSULATION TAPE ELECTRICAL	4
✱	1.0	1006806-9	INSULATION TAPE, ELECTRICAL	3
✱	1.0	1006806-2	INSULATION TAPE, ELECTRICAL	2
	AR	1006757-7	WIRE, ELECTRICAL .005X.020	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082-	
1003081-	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ±.010 ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO. CONTRACT
DRAWN J.A. Boffin DATE
CHECKED R. Smith 6 June 63
APPROVAL
APPROVAL D. Dyer 7/31/63
NASA APPROVAL
MIT APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

1400 MATRIX ASSEMBLY
(TABULATED)

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003063
SCALE 4/1
WT
SHEET 1 OF 1

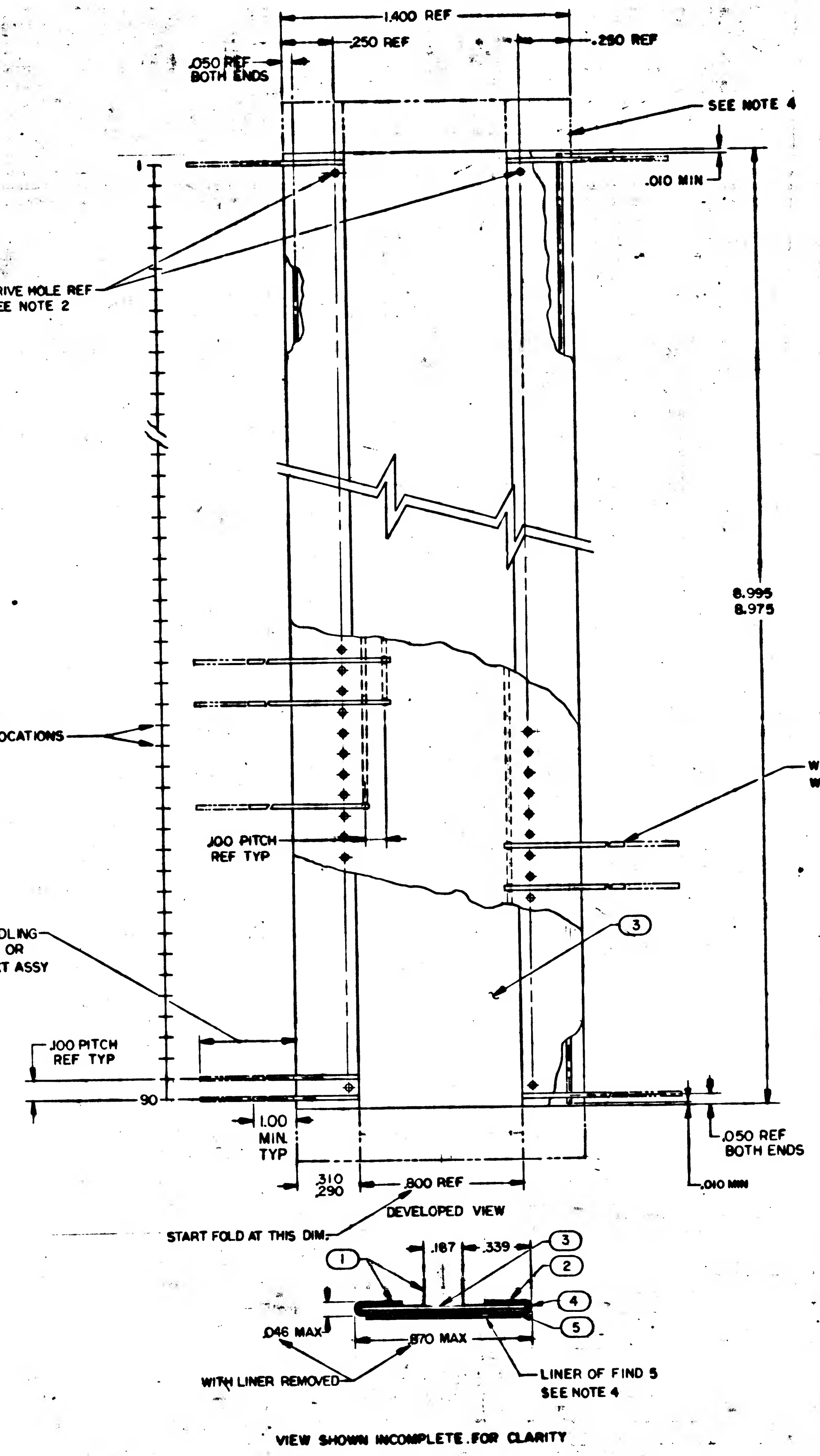
1003063

MASTER

INCHES
PHOTOGRAPHIC SCALE ONLY

MODULE NO.	PART NO.	REV	SIGNAL WIRING DIAGRAM		
			DRAWING NO.	REV	MATRIX NO.
A1-A16	1003063-1	G	1006120		2
A1-A16	1003063-2	G	1006120		3
A35	1003063-3	G	1006121		2
A35	1003063-4	G	1006121		3
~~A18~~	~~1003063-5~~		~~1006122~~		~~2~~
~~A18~~	~~1003063-6~~		~~1006122~~		~~3~~
A17	1003063-7	G	1006123		2
A17	1003063-8	G	1006123		3
~~A27~~	~~1003063-9~~		~~1006124~~		~~2~~
~~A27~~	~~1003063-10~~		~~1006124~~		~~3~~
A23	1003063-11	G	1006125		2
A23	1003063-12	G	1006125		3
A32	1003063-13	G	1006126		2
A32	1003063-14	G	1006126		3
A33-A34	1003063-15	G	1006127		2
A33-A34	1003063-16	G	1006127		3
A30-A31	1003063-17	G	1006128		2
A30-A31	1003063-18	G	1006128		3
~~A26~~	~~1003063-19~~	G	~~1006129~~		~~2~~
A26	1003063-20	G	1006129		3
A37	1003063-21	G	1006130		2
A37	1003063-22	G	1006130		3
~~A38~~	~~1003063-23~~		~~1006131~~		~~2~~
A38	1003063-24	G	1006131		3
~~A28~~	~~1003063-25~~		~~1006132~~		~~2~~
~~A28~~	~~1003063-26~~		~~1006132~~		~~3~~
~~A22~~	~~1003063-27~~		~~1006133~~		~~2~~
A22	1003063-28	G	1006133		3
A25	1003063-29	G	1006134		2
A25	1003063-30	G	1006134		3
A24	1003063-31	G	1006135		2
A24	1003063-32	G	1006135		3
A21	1003063-33	G	1006136		2
~~A21~~	~~1003063-34~~	~~G~~	~~1006136~~		~~3~~
A36	1003063-35	G	1006137		2
~~A36~~	~~1003063-36~~		~~1006137~~		~~3~~
~~A29~~	~~1003063-37~~	~~G~~	~~1006139~~		~~2~~
~~A29~~	~~1003063-38~~	~~G~~	~~1006139~~		~~3~~
A26	1003063-39	G	1006129	A	2
A36	1003063-40	G	1006137	A	3
A18	1003063-41	G	1006122	A	2
A18	1003063-42	G	1006122	A	3
A22	1003063-43	G	1006133	A	2
A38	1003063-44	G	1006131	B	2
A27	1003063-45	G	1006124	A	2
A27	1003063-46	G	1006124	A	3
A28	1003063-47	G	1006132	A	2
A28	1003063-48	G	1006132	A	3
A21	1003063-49	H	1006136	B	3
A29	1003063-50	J	1006139	B	2
A29	1003063-51	K	1005761	—	2
A29	1003063-52	K	1005761	—	3

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGE PER TDRR 02119	[illegible]	[illegible]
D	CHANGED PER TDRR 03127	[illegible]	[illegible]
E	REVISED PER TDRR 03436	9-26-63	[illegible]
F	REVISED PER TDRR 03597	10-2-63	[illegible]
G	REVISED PER TDRR 04006	10-17-63	[illegible]
H	REVISED PER TDRR 06315	[illegible]	[illegible]
J	REVISED PER TDRR 06750	[illegible]	[illegible]
*	REVISED PER TDRR 6353 DR [illegible] CHK [illegible]	[illegible]	[illegible]



NOTES
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER ND 1002030
3. * DENOTES LENGTH IN FEET
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY
5. AR DENOTES AS REQUIRED

Ⓒ REPLACES REV B WITH CHANGE

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
* 1.0	1006806-7	INSULATION TAPE ELECTRICAL	5
* 1.0	1006806-12	INSULATION TAPE ELECTRICAL	4
* 1.0	1006806-9	INSULATION TAPE, ELECTRICAL	3
* 1.0	1006806-2	INSULATION TAPE, ELECTRICAL	2
AR	1006757-7	WIRE, ELECTRICAL .005 X .020	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003814	
1003813	
1003082-	
1003081-	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ±.010 ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT
DRAWN [illegible] DATE [illegible]
CHECKED [illegible]
APPROVAL [illegible]
APPROVAL [illegible] 7/31/62
NASA APPROVAL [illegible]
MIT APPROVAL [illegible]
MIT APPROVAL [illegible]

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

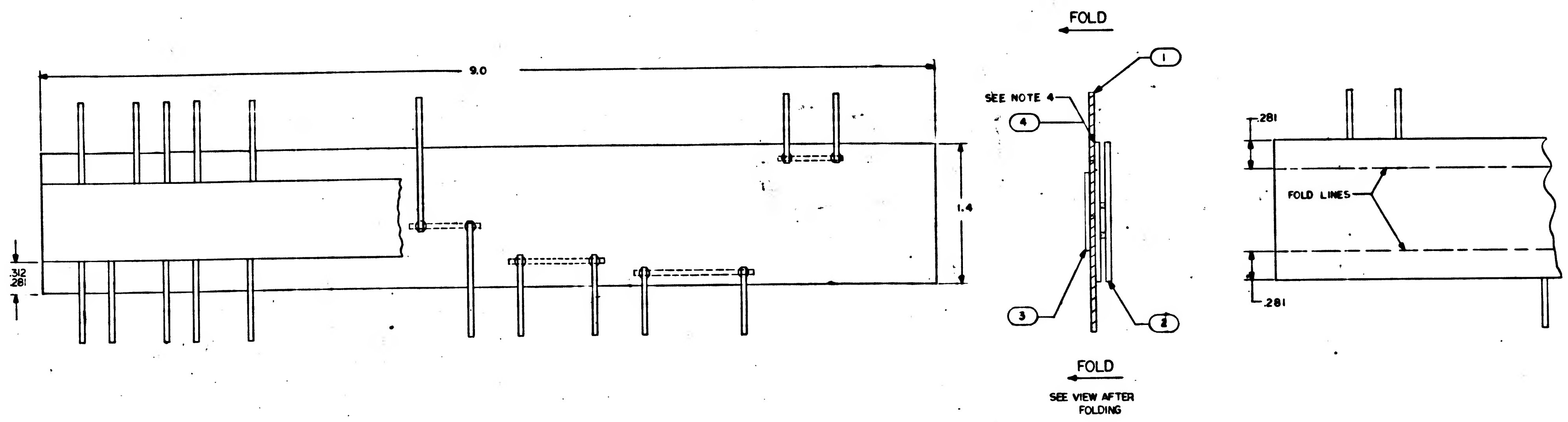
1600 MATRIX ASSEMBLY
(TABULATED)

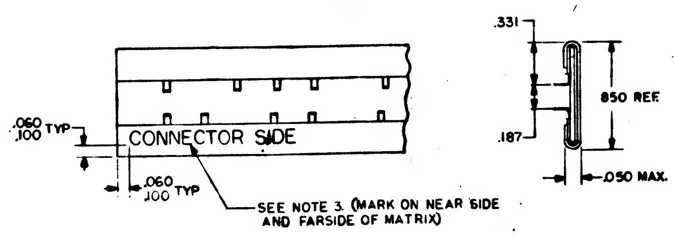
CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003063
SCALE 4/1
WT
SHEET 1 OF 1

MASTER

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL





VIEW OF MATRIX AFTER FOLDING

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00636 DATE 20 Mar 63

STICK IDENTIFICATION	WIRING MATRIX DIAGRAM	PART DASH NO. [ODD]	PART DASH NO. [EVEN]
ARITHMETIC STICK C1-16	1006075	1003063-1	1003063-2
		-3	-4

NOTES:—
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS BY MIL-D-70327
2. WELD PER ND 1002005
3. STENCIL 3/32 HIGH BLACK LETTERS AS SHOWN PER ND1002019
4. TAPE (FIND NO. 4) PROGRAMED PER

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
AS REQ'D	1006806	TAPE ADHESIVE	4
1	1004081	INSULATOR MYLAR	3
1	1004081	INSULATOR, MYLAR	2
AR	1006757-7	005 X.020 WIRE, ELECTRICAL	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082	
1003081	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ±.010 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG NO CONTRACT
DRAWN Bonanno DATE 12/7/62
CHECKED
APPROVAL 1/29/63
APPROVAL
NASA APPROVAL 3/20/63
MIT APPROVAL W Kupfer 20 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

1400 MATRIX ASSEMBLY
STICK (TAB)

CODE IDENT NO. SIZE E NASA DRAWING NO. 1003063
SCALE 2/1 WT SHEET 1 OF 1

INCHES
PHOTOGRAPHIC SCALE ONLY

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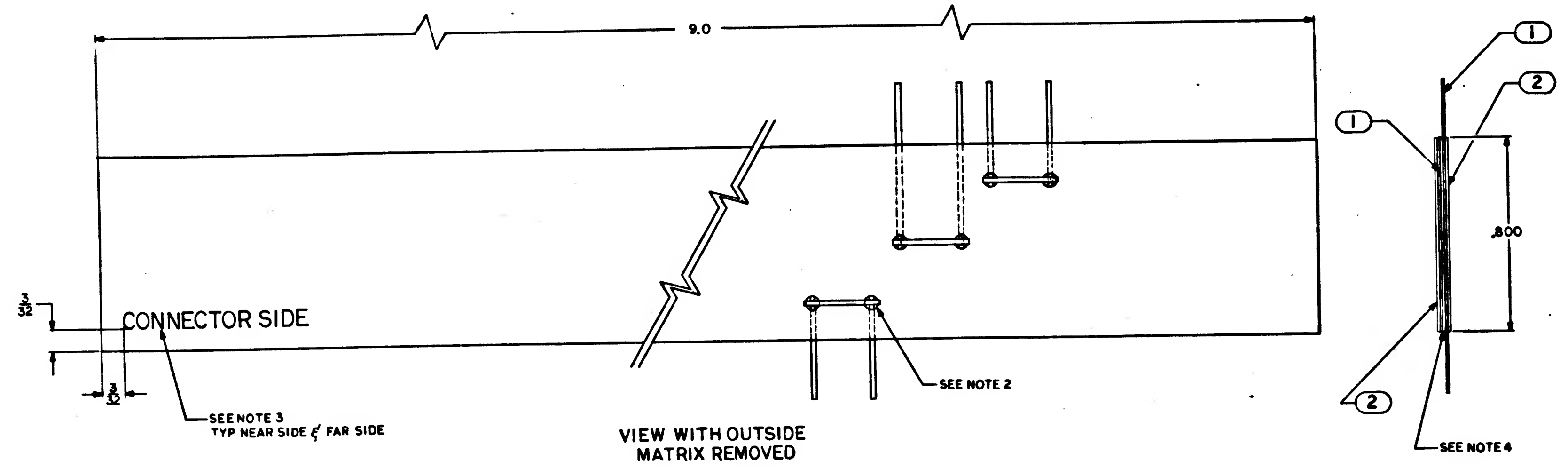
REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISIED AND UPGRADED TO CLASS A PER TDRR		



STICK IDENTIFICATION	WIRING MATRIX DIAGRAM	PART DASH NO. MATRIX 4	PART DASH NO. MATRIX 6	PART DASH NO. MATRIX 5	PART DASH NO. MATRIX 7
ARITHMETIC STICK	1006075	1003064-1	—	1003064-3	—

NOTES:—
1. INTERPRET DRAWING IN ACCORDANCE WITH ST NDARDS BY MIL-D-70327
2. W PER ND 1002005
3. STENCIL 3/32 HIGH BLACK LETTERS AS SHOWN
4. TAPE, (DOUBLE SIDED ADHESIVE) PROGRAMED PER

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
AR	1006806	TAPE, ADHESIVE	2
AR	1006757-7	005 X 020 WIRE, ELECTRICAL	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ±.010 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT
DRAWN Bonanno DATE 12/7/62
CHECKED 3/5/63
APPROVAL 3/5/63
APPROVAL 3/1/63
NASA APPROVAL
MIT APPROVAL 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

.800 MATRIX ASSEMBLY
STICK (TAB)

CODE IDENT NO.
SIZE E
NASA DRAWING NO 1003064
SCALE 4/1 WT — SHEET 1 OF 1

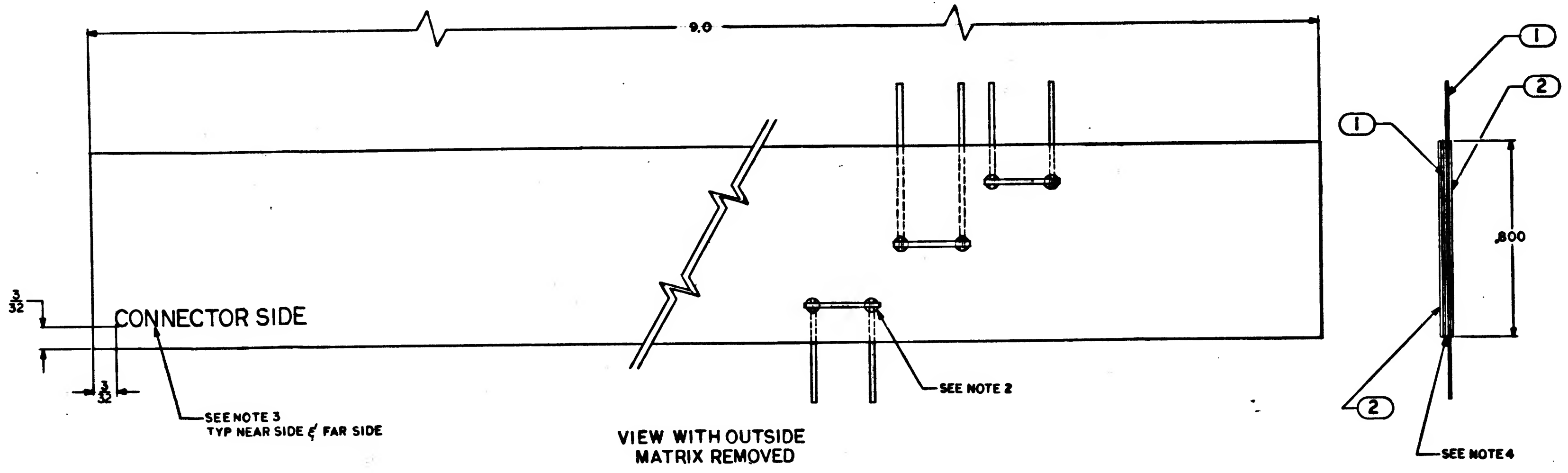
1003064 A

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISIED AND UPGRADED TO CLASS A PER TORR		WBT
B	REDRAWN & SUPERSEDED BY REV C WITH CHANGES PER TDRR 2229O		WBT 7/3



STICK IDENTIFICATION	WIRING MATRIX DIAGRAM	PART DASH NO. MATRIX 4	PART DASH NO. MATRIX 6	PART DASH NO. MATRIX 5	PART DASH NO. MATRIX 7
ARITHMETIC STICK	1006075	1003064-1	—	1003064-3	—

Ⓑ SUPERSEDED BY REV C

NOTES:—

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS BY MIL-D-70327
2. WELD PER ND 1002005
3. STENCIL 3/32 HIGH BLACK LETTERS AS SHOWN
4. TAPE, (DOUBLE SIDED ADHESIVE) PROGRAMED PER

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1006806	TAPE, ADHESIVE	2
A	1006757-7	.005 X .020 WIRE, ELECTRICAL	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ±.010 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

M I T
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT
DRAWN Bonazzigo DATE 12/7/62
CHECKED 3/5/63
APPROVAL W.B. Turner 3/5/63
APPROVAL 3/1/63
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

.800 MATRIX ASSEMBLY
STICK (TAB)

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003064
SCALE 4/1
WT —
SHEET 1 OF 1

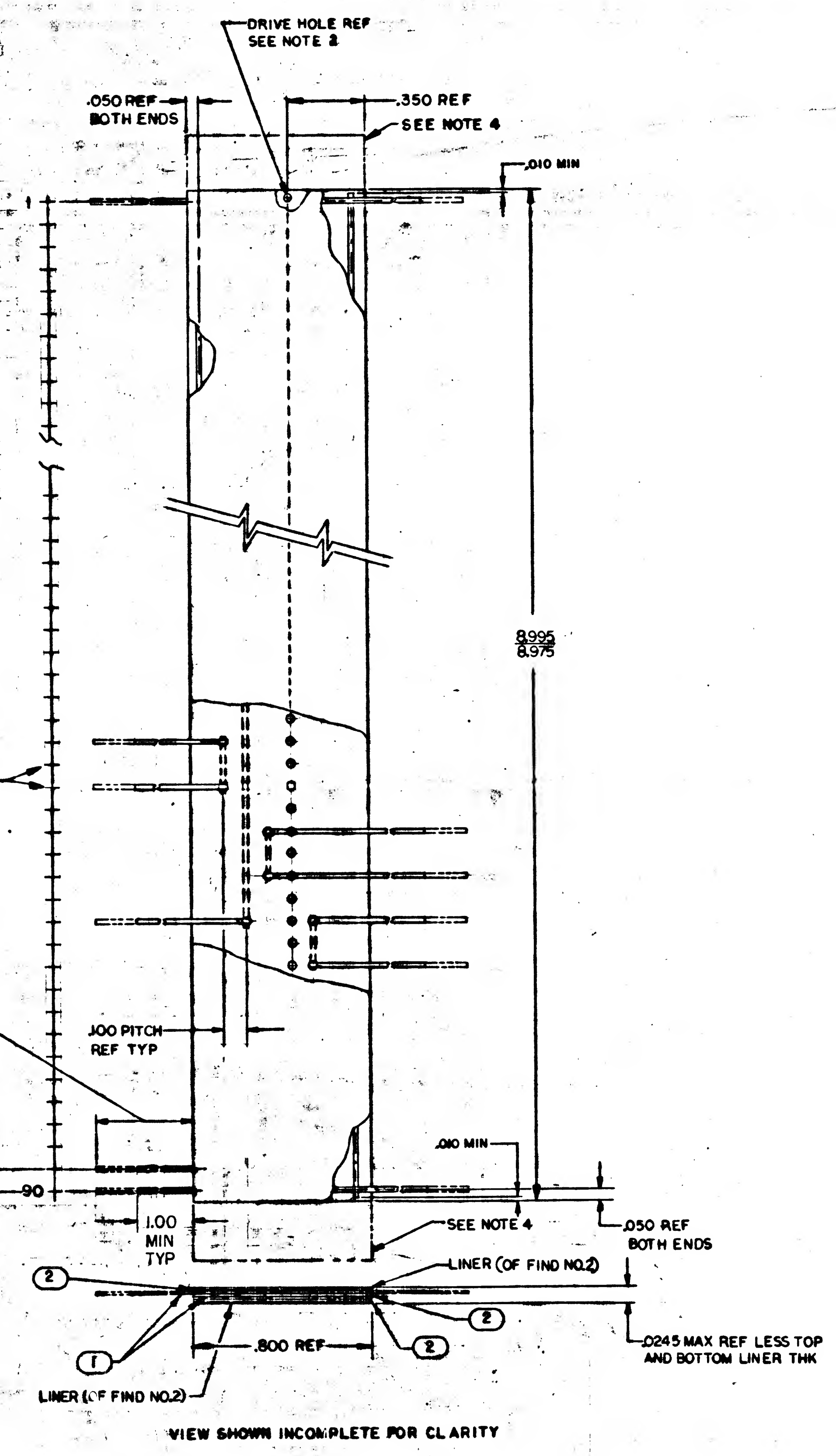
1003064 B

INCHES
PHOTOGRAPHIC SCALE ONLY

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGES PER TDRR 02290		

MODULE NUMBER	SIGNAL WIRING DIAG	PART NO. OF MATRIX 4 ON WIRING DIAG	PART NO. OF MATRIX 6 ON WIRING DIAG	PART NO. OF MATRIX 5 ON WIRING DIAG	PART NO. OF MATRIX 7 ON WIRING DIAG
A1-A16	1006120	1003064-1	———	1003064-3	———
A35					
A18	1006122	1003064-9	———	1003064-11	———
A17	1006123	1003064-13	———	1003064-15	———
A27					
A25					
A32					
A33-A34	1006127	1003064-29	———	1003064-31	———
A30-A31	1006128	1003064-33	———	1003064-35	———
A26					
A37					
A38	1006131	1003064-45	———	1003064-47	———
A28	1006132	1003064-49	———	1003064-51	———
A22	1006133	1003064-53	———	1003064-55	1003064-56
A23					
A24	1006135	1003064-61	1003064-62	1003064-63	1003064-64
A21	1006136	1003064-65	1003064-66	1003064-67	1003064-68
A36					
A29					



VIEW SHOWN INCOMPLETE FOR CLARITY

REPLACES REV B WITH CHANGE

NOTES
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER ND 1002030
3. ✱ DENOTES LENGTH IN FEET
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
✱3.0	1006806-1	INSULATION TAPE, ELECTRICAL	2
AR	1006757-7	WIRE, ELECTRICAL .005 X .020	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
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MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DRAWN R W POLLINI DATE 3 MAY 63
CHECKED
APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

800 MATRIX ASSEMBLY
STICK (TAB)

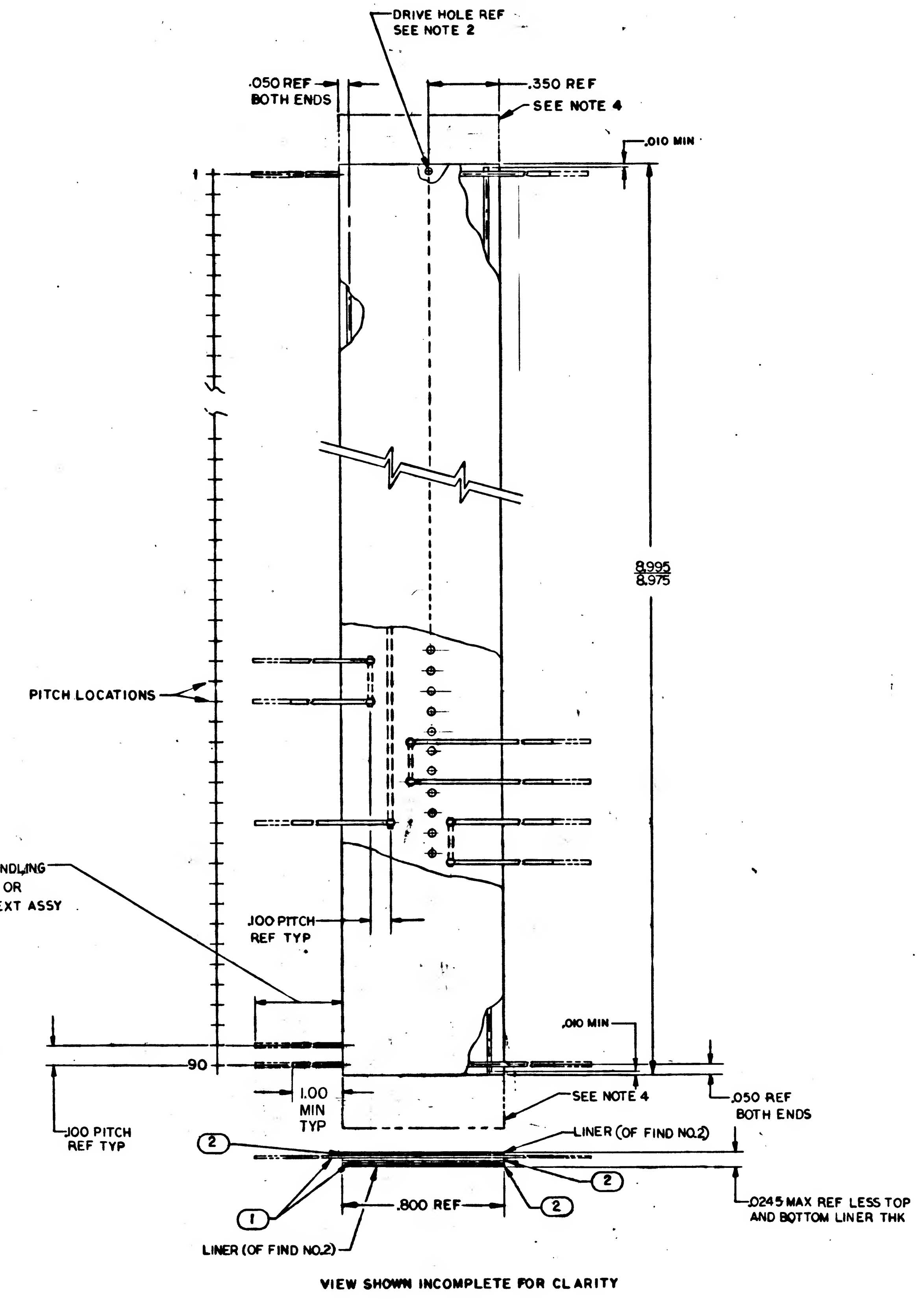
CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003064
SCALE 4/1
WT
SHEET 1 OF 1

MASTER

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGES PER TDRR 02290	30 Jul 63 7/31	
D	REVISED PER TDRR 03.23	7-12-63	

PART NO	REV	SIGNAL WIRING DIAGRAM		
		DRAWING NO	REV	MATRIX NO
1003064-1		1006120		4
1003064-3		1006120		5
1003064-5		1006121		4
1003064-7		1006121		5
1003064-9		1006122		4
1003064-11		1006122		5
1003064-13		1006123		4
1003064-15		1006123		5
1003064-17		1006124		4
1003064-19	—	1006124		5
1003064-21		1006134		4
1003064-23		1006134		5
1003064-25		1006126		4
1003064-27		1006126		5
1003064-29		1006127		4
1003064-31		1006127		5
1003064-33		1006128		4
1003064-35		1006128		5
1003064-37		1006129		4
1003064-39		1006129		5
1003064-41		1006130		4
1003064-43		1006130		5
1003064-45		1006131		4
1003064-47		1006131		5
1003064-49		1006132		4
1003064-51		1006132		5
1003064-53		1006133		4
1003064-55		1006133		5
1003064-56		1006133		7
1003064-57		1006125		4
1003064-59		1006125		5
1003064-61		1006135		4
1003064-62		1006135		6
1003064-63		1006135		5
1003064-64		1006135		7
1003064-65		1006136		4
1003064-66		1006136		6
1003064-67		1006136		5
1003064-68		1006136		7
1003064-70		1006137		4
1003064-71		1006139		5
1003064-73		1006139		4
1003064-75		1006137		5



VIEW SHOWN INCOMPLETE FOR CLARITY

NOTES
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER NO 1002030
3. ✱ DENOTES LENGTH IN FEET
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY

REPLACES REV B WITH CHANGE

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
✱ 3.0	1006806-1	INSULATION TAPE, ELECTRICAL	2
AR	1006757-7	WIRE, ELECTRICAL .005 X .020	1

LIST OF MATERIALS

NEXT ASSY	USED ON		
APPLICATION			

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN F.W. POLLINI DATE 3 MAY 63
CHECKED 3 May 63
APPROVAL 7 29
APPROVAL 7/31/63
NASA APPROVAL 7/31/63
MIT APPROVAL 7/31/63

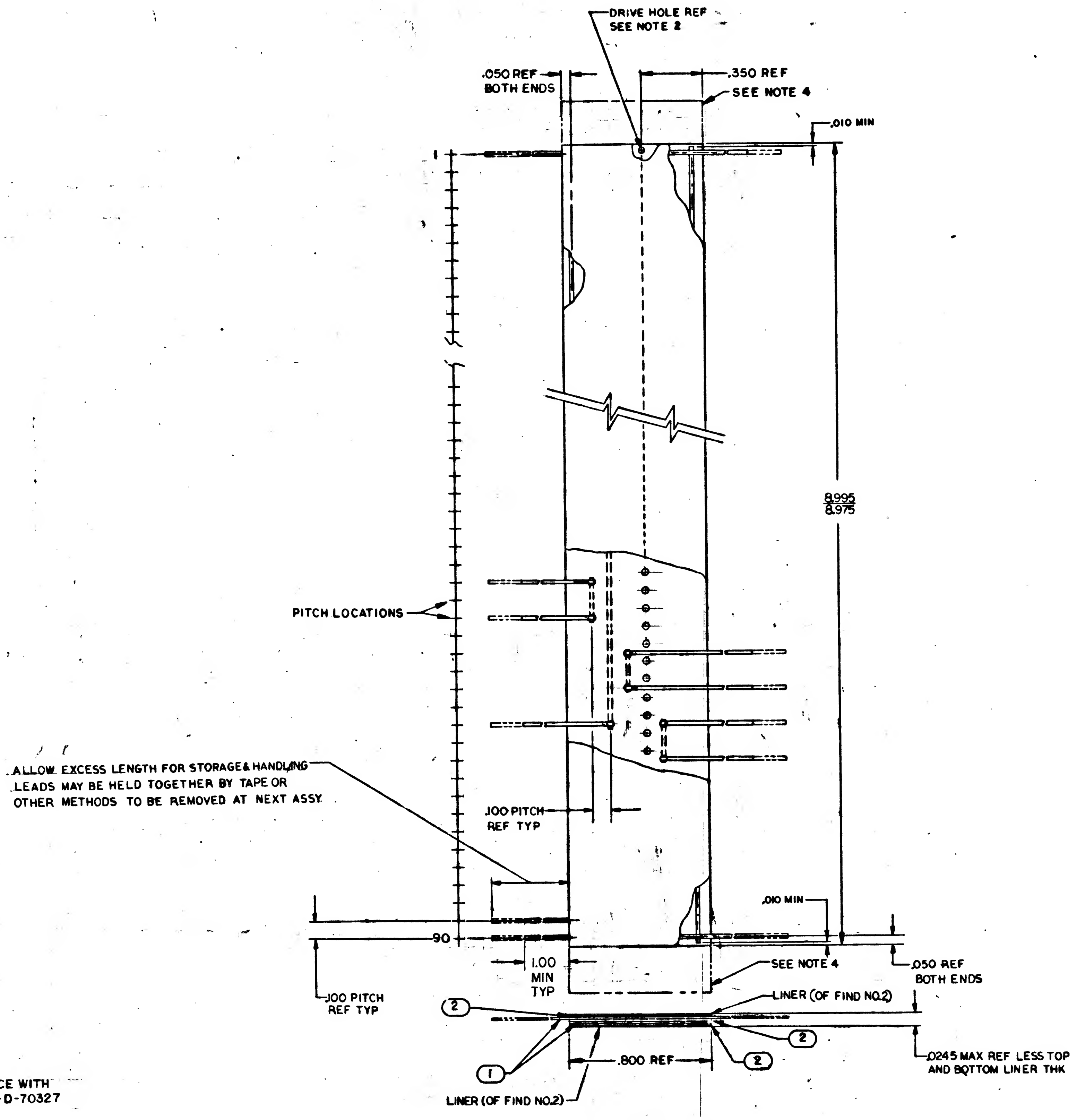
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

800 MATRIX ASSEMBLY
STICK (TAB)

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003064
SCALE 4/1
WT
SHEET 1 OF 1

SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGES PER TDRR 02290	[illegible] 7/31	[illegible]
D	REVISED PER TDRR 03123	7-12-63	[illegible]
E	REVISED PER TDRR 03430	9-26-63	[illegible]

MODULE NO.	PART NO	REV	SIGNAL WIRING DIAGRAM		
			DRAWING NO	REV	MATRIX NO
A1-A16	1003064-1		1006120		4
A1-A16	1003064-3		1006120		5
A35	1003064-5		1006121		4
A35	1003064-7		1006121		5
A18	1003064-9		1006122		4
A18	1003064-11		1006122		5
A17	1003064-13		1006123		4
A17	1003064-15		1006123		5
A27	1003064-17		1006124		4
A27	1003064-19	—	1006124		5
A25	1003064-21		1006134		4
A25	1003064-23		1006134		5
A32	1003064-25		1006126		4
A32	1003064-27		1006126		5
A33-A34	1003064-29		1006127		4
A33-A34	1003064-31		1006127		5
A30-A31	1003064-33		1006128		4
A30-A31	1003064-35		1006128		5
A26	1003064-37		1006129		4
A26	1003064-39		1006129		5
A37	1003064-41		1006130		4
~~A37~~	~~1003064-43~~		~~1006130~~		~~5~~
A38	1003064-45		1006131		4
A38	1003064-47		1006131		5
A28	1003064-49		1006132		4
A28	1003064-51		1006132		5
A22	1003064-53		1006133		4
A22	1003064-55		1006133		5
A22	1003064-56		1006133		7
A23	1003064-57		1006125		4
A23	1003064-59		1006125		5
A24	1003064-61		1006135		4
A24	1003064-62		1006135		6
A24	1003064-63		1006135		5
A24	1003064-64		1006135		7
A21	1003064-65		1006136		4
A21	1003064-66		1006136		6
A21	1003064-67		1006136		5
A21	1003064-68		1006136		7
A36	1003064-69		1006137		4
A36	1003064-71		1006137		5
A29	1003064-73		1006139		4
A29	1003064-75		1006139		5
A37	1003064-76	E	1006130	A	5



VIEW SHOWN INCOMPLETE FOR CLARITY

REPLACES REV B WITH CHANGE

NOTES
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER ND 1002030
3. * DENOTES LENGTH IN FEET
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
* 3.0	1006806-1	INSULATION TAPE, ELECTRICAL	2
AR	1006757-7	WIRE, ELECTRICAL .005 X .020	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082-	
1003081-	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ± —
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MATERIAL —
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FINAL FINISH —

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DWG. NO. CONTRACT
DRAWN R.W. Pohlin DATE 3 MAY 63
CHECKED [illegible]
APPROVAL [illegible] 7 29 63
APPROVAL [illegible]
NASA APPROVAL [illegible] 7/31/63
MIT APPROVAL [illegible] 7/31/63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

800 MATRIX ASSEMBLY
STICK (TAB)

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003064
SCALE 4/1
WT
SHEET 1 OF 1

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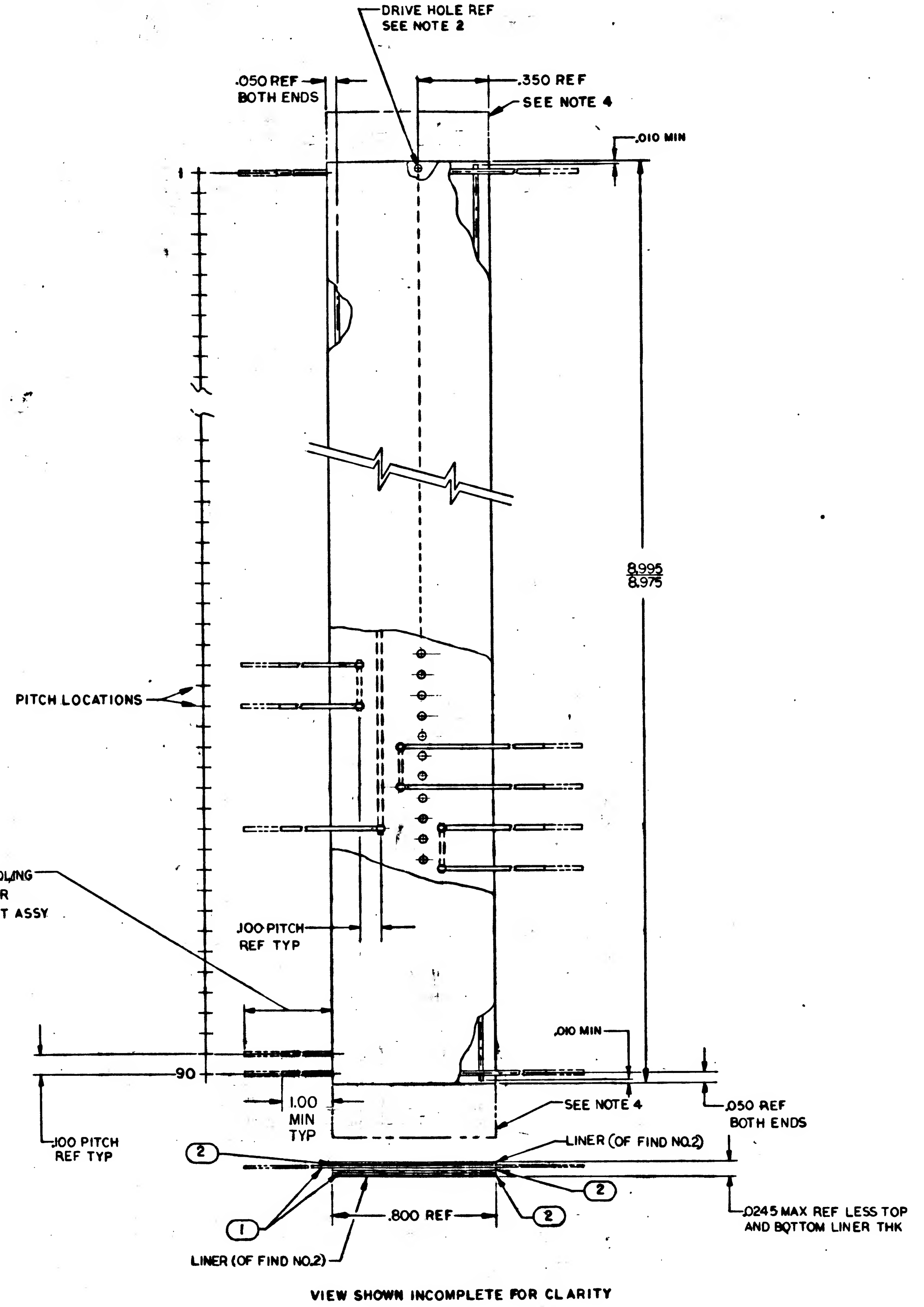
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGES PER TDRR 02290	30 MAY 63 7/31	
D	REVISED PER TDRR 03123	9-12-63	
E	REVISED PER TDRR 03438	9-26-63	
F	REVISED PEP TDRR 03569	10-3-63	

MODULE NO.	PART NC	REV	SIGNAL WIRING DIAGRAM DRAWING NO	SIGNAL WIRING DIAGRAM REV	SIGNAL WIRING DIAGRAM MATRIX NO
A1-A16	1003064-1		1006120		4
A1-A16	1003064-3		1006120		5
A35	1003064-5		1006121		4
A35	1003064-7		1006121		5
~~A18~~	~~1003064-9~~		~~1006122~~		~~4~~
~~A18~~	~~1003064-11~~		~~1006122~~		~~5~~
A17	1003064-13		1006123		4
~~A17~~	~~1003064-15~~		~~1006123~~		~~5~~
A27	1003064-17		1006124		4
A27	1003064-19	—	1006124		5
A25	1003064-21		1006134		4
A25	1003064-23		1006134		5
A32	1003064-25		1006126		4
A32	1003064-27		1006126		5
A33-A34	1003064-29		1006127		4
A33-A34	1003064-31		1006127		5
A30-A31	1003064-33		1006128		4
A30-A31	1003064-35		1006128		5
A26	1003064-37		1006129		4
A26	1003064-39		1006129		5
A37	1003064-41		1006130		4
~~A37~~	~~1003064-43~~		~~1006130~~		~~5~~
~~A38~~	~~1003064-45~~		~~1006131~~		~~4~~
A38	1003064-47		1006131		5
~~A28~~	~~1003064-49~~		~~1006132~~		~~4~~
~~A28~~	~~1003064-51~~		~~1006132~~		~~5~~
~~A22~~	~~1003064-53~~		~~1006133~~		~~4~~
A22	1003064-55		1006133		5
A22	1003064-56		1006133		7
A23	1003064-57		1006125		4
A23	1003064-59		1006125		5
A24	1003064-61		1006135		4
A24	1003064-62		1006135		6
A24	1003064-63		1006135		5
A24	1003064-64		1006135		7
A21	1003064-65		1006136		4
A21	1003064-66		1006136		6
A21	1003064-67		1006136		5
A21	1003064-68		1006136		7
~~A36~~	~~1003064-69~~		~~1006137~~		~~4~~
~~A36~~	~~1003064-71~~		~~1006137~~		~~5~~
A29	1003064-73		1006139		4
A29	1003064-75		1006139		5
A37	1003064-76	E	1006130	A	5
A36	1003064-77	F	1006137	A	4
A36	1003064-78	F	1006137	A	5
A18	1003064-88	F	1006122	A	4
A18	1003064-89	F	1006122	A	5
A22	1003064-90	F	1006133	A	4
A38	1003064-91	F	1006131	B	4
A17	1003064-92	F	1006123	C	5
A28	1003064-93	F	1006132	A	4
A28	1003064-94	F	1006132	A	5



VIEW SHOWN INCOMPLETE FOR CLARITY

REPLACES REV B WITH CHANGE

NOTES
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER ND 1002030
3. ✱ DENOTES LENGTH IN FEET
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
✱ 3.0	1006806-1	INSULATION TAPE, ELECTRICAL	2
AR	1006757-7	WIRE, ELECTRICAL .005 X .020	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082-	
1003081-	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

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INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG NO CONTRACT
DRAWN F.W. POLLINI DATE 3 MAY 63
CHECKED [illegible] 3 May 63
APPROVAL [illegible] 7 24 63
APPROVAL [illegible] 7/31/63
NASA APPROVAL [illegible] 7/31/63
MIT APPROVAL [illegible] 7/31/63

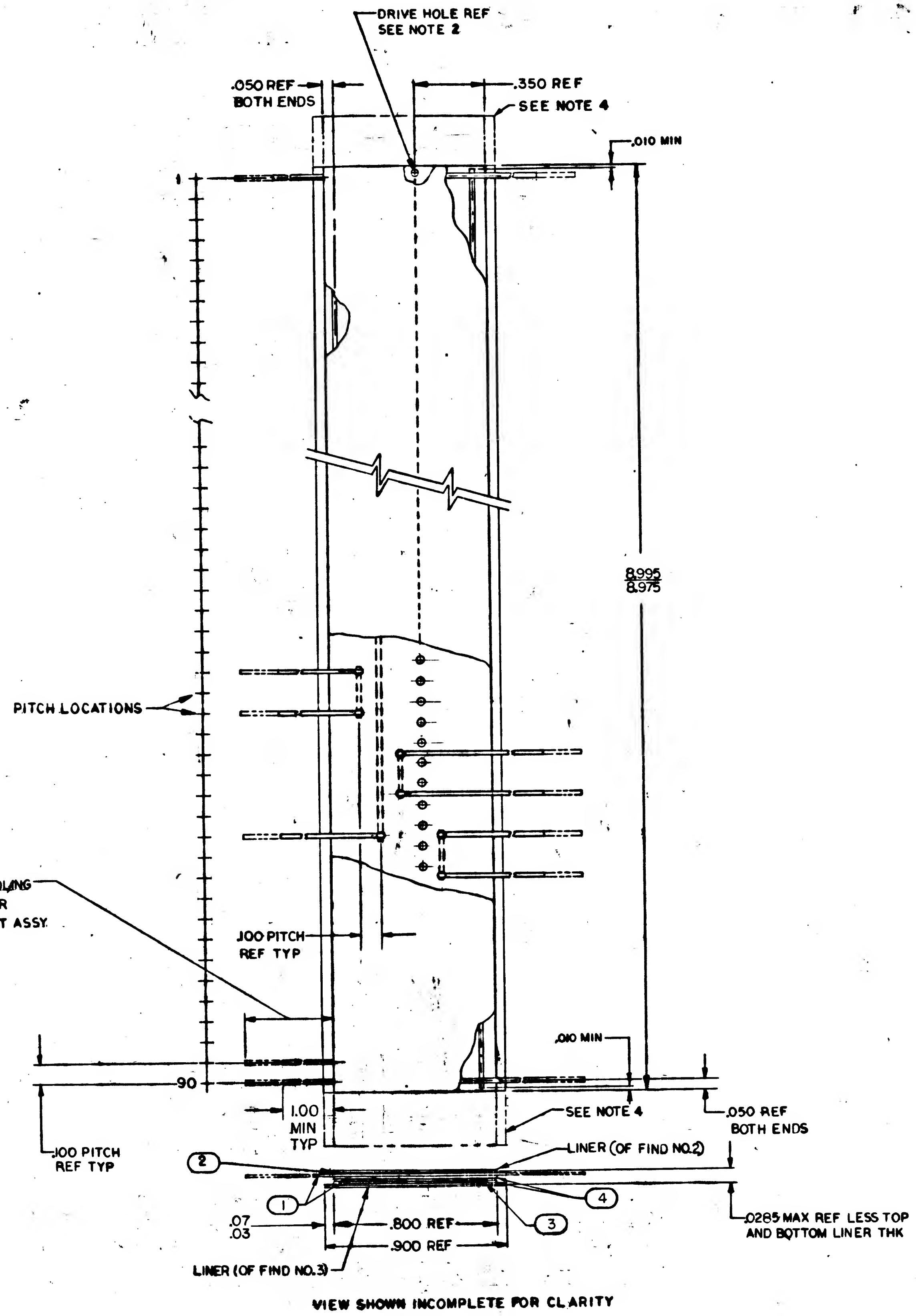
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

800 MATRIX ASSEMBLY
STICK (TAB)

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003064
SCALE 4/1
WT
SHEET 1 OF 1

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGES PER TDRR 02290	7/31	
D	REVISED PER TDRR 03123	9-12-63	
E	REVISED PER TDRR 03438	9-26-63	
F	REVISED PER TDRR 03581	10-3-63	
G	REVISED PER TDRR 04025	10-16-63	

MODULE NO.	PART NO	REV	SIGNAL WIRING DIAGRAM		
			DRAWING NO	REV	MATRIX NO
A1-A16	1003064-1	G	1006120		4
A1-A16	1003064-3	G	1006120		5
A35	1003064-5	G	1006121		4
A35	1003064-7	G	1006121		5
~~A18~~	~~1003064-9~~		~~1006122~~		~~4~~
~~A18~~	~~1003064-11~~		~~1006122~~		~~5~~
A17	1003064-13	G	1006123		4
~~A17~~	~~1003064-15~~		~~1006123~~		~~5~~
A27	1003064-17	G	1006124		4
A27	1003064-19	G	1006124		5
A25	1003064-21	G	1006134		4
A25	1003064-23	G	1006134		5
A32	1003064-25	G	1006126		4
A32	1003064-27	G	1006126		5
A33-A34	1003064-29	G	1006127		4
A33-A34	1003064-31	G	1006127		5
A30-A31	1003064-33	G	1006128		4
A30-A31	1003064-35	G	1006128		5
A26	1003064-37	G	1006129		4
A26	1003064-39	G	1006129		5
A37	1003064-41	G	1006130		4
~~A37~~	~~1003064-43~~		~~1006130~~		~~5~~
~~A38~~	~~1003064-45~~		~~1006131~~		~~4~~
A38	1003064-47	G	1006131		5
~~A28~~	~~1003064-49~~		~~1006132~~		~~4~~
~~A28~~	~~1003064-51~~		~~1006132~~		~~5~~
~~A22~~	~~1003064-53~~		~~1006133~~		~~4~~
A22	1003064-55	G	1006133		5
A22	1003064-56	G	1006133		7
A23	1003064-57	G	1006125		4
A23	1003064-59	G	1006125		5
A24	1003064-61	G	1006135		4
A24	1003064-62	G	1006135		6
A24	1003064-63	G	1006135		5
A24	1003064-64	G	1006135		7
A21	1003064-65	G	1006136		4
A21	1003064-66	G	1006136		6
A21	1003064-67	G	1006136		5
A21	1003064-68	G	1006136		7
~~A36~~	~~1003064-69~~		~~1006137~~		~~4~~
~~A36~~	~~1003064-71~~		~~1006137~~		~~5~~
A29	1003064-73	G	1006139		4
A29	1003064-75	G	1006139		5
A37	1003064-76	G	1006130	A	5
A36	1003064-77	G	1006137	A	4
A36	1003064-78	G	1006137	A	5
A18	1003064-88	G	1006122	A	4
A18	1003064-89	G	1006122	A	5
A22	1003064-90	G	1006133	A	4
A38	1003064-91	G	1006131	B	4
A17	1003064-92	G	1006123	C	5
A28	1003064-93	G	1006132	A	4
A28	1003064-94	G	1006132	A	5



ALLOW EXCESS LENGTH FOR STORAGE & HANDLING
LEADS MAY BE HELD TOGETHER BY TAPE OR
OTHER METHODS TO BE REMOVED AT NEXT ASSY.

VIEW SHOWN INCOMPLETE FOR CLARITY

REPLACES REV B WITH CHANGE

NOTES

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER NO. 1002030
3. * DENOTES LENGTH IN FEET
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MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
* 1.0	1006806-11	INSULATION TAPE, ELECTRICAL	4
* 1.0	1006806-10	INSULATION TAPE, ELECTRICAL	3
* 1.0	1006806-1	INSULATION TAPE, ELECTRICAL	2
AR	1006757-7	WIRE, ELECTRICAL .005 X.020	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082-	
1003081-	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
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HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG NO. CONTRACT
DRAWN R.W. POLLINI DATE 3 MAY 63
CHECKED
APPROVAL 7 24
APPROVAL 7/24/63
NASA APPROVAL 7/31/63
MIT APPROVAL 7/24/63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

800 MATRIX ASSEMBLY
STICK (TAB)

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003064
SCALE 4/1
WT
SHEET 1 OF 1

INCHES
PHOTOGRAPHIC SCALE ONLY

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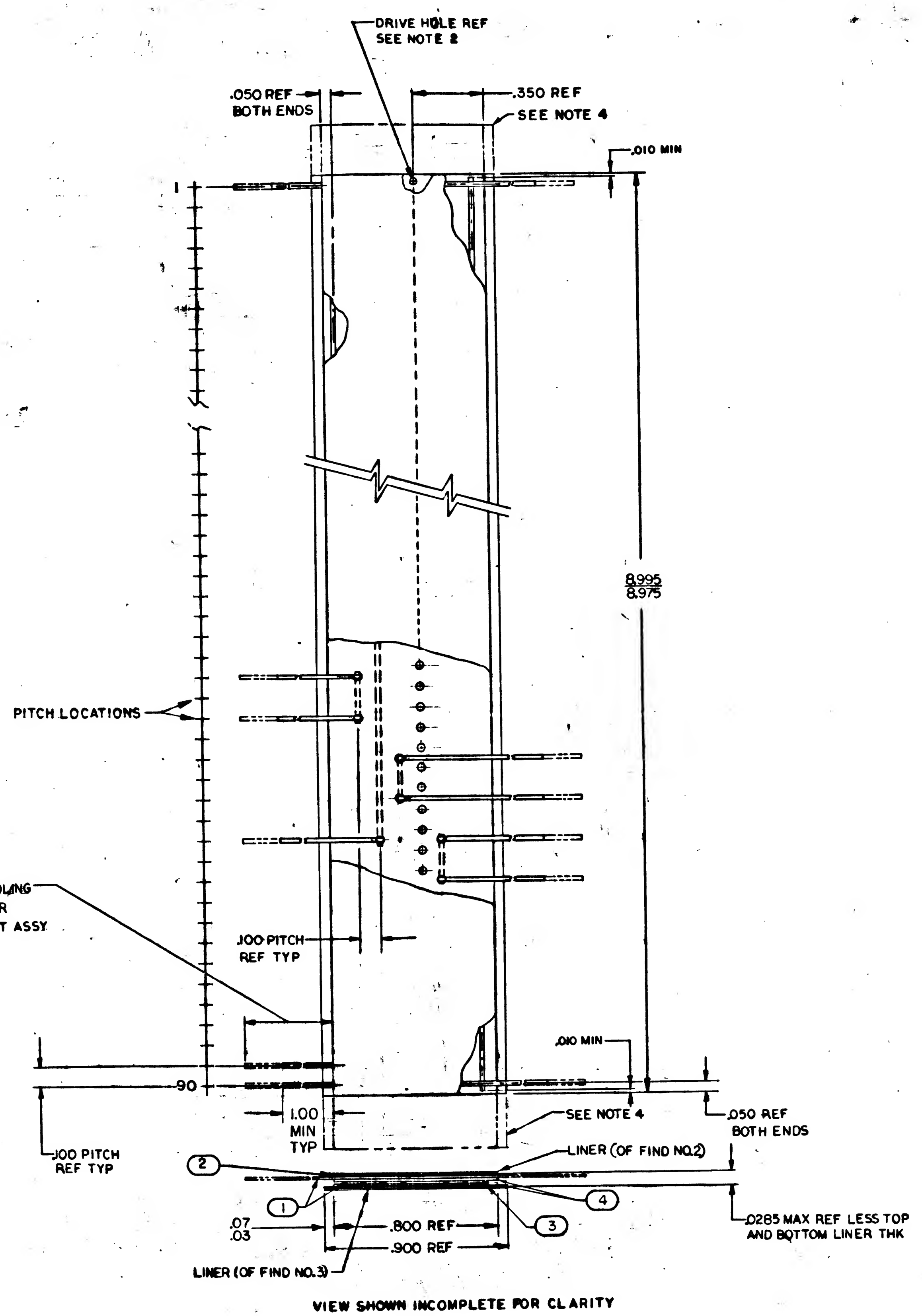
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGES PER TDRR 02290	10-30-63 7/31	
D	REVISED PER TDRR 03123	7-12-63	
E	REVISED PER TDRR 03438	9-26-63	
F	REVISED PER TDRR 03561	10-3-63	
G	REVISED PER TDRR 04025	10-16-63	
H	REVISED PEP TDRR 04385		

MODULE NO.	PART NO	REV	SIGNAL WIRING DIAGRAM DRAWING NO	REV	MATRIX NO
A1-A16	1003064-1	G	1006120		4
A1-A16	1003064-3	G	1006120		5
A35	1003064-5	G	1006121		4
A35	1003064-7	G	1006121		5
~~A18~~	~~1003064-9~~		~~1006122~~		~~4~~
~~A18~~	~~1003064-11~~		~~1006122~~		~~5~~
A17	1003064-13	G	1006123		4
~~A17~~	~~1003064-15~~		~~1006123~~		~~5~~
A27	1003064-17	G	1006124		4
A27	1003064-19	G	1006124		5
A25	1003064-21	G	1006134		4
A25	1003064-23	G	1006134		5
A32	1003064-25	G	1006126		4
A32	1003064-27	G	1006126		5
A33-A34	1003064-29	G	1006127		4
A33-A34	1003064-31	G	1006127		5
A30-A31	1003064-33	G	1006128		4
A30-A31	1003064-35	G	1006128		5
A26	1003064-37	G	1006129		4
A26	1003064-39	G	1006129		5
A37	1003064-41	G	1006130		4
~~A37~~	~~1003064-43~~		~~1006130~~		~~5~~
~~A38~~	~~1003064-46~~		~~1006131~~		~~4~~
A38	1003064-47	G	1006131		5
~~A28~~	~~1003064-49~~		~~1006132~~		~~4~~
~~A28~~	~~1003064-51~~		~~1006132~~		~~5~~
~~A22~~	~~1003064-53~~		~~1006133~~		~~4~~
A22	1003064-55	G	1006133		5
A22	1003064-56	G	1006133		7
A23	1003064-57	G	1006125		4
A23	1003064-59	G	1006125		5
A24	1003064-61	G	1006135		4
A24	1003064-62	G	1006135		6
A24	1003064-63	G	1006135		5
A24	1003064-64	G	1006135		7
A21	1003064-65	G	1006136		4
A21	1003064-66	G	1006136		6
A21	1003064-67	G	1006136		5
A21	1003064-68	G	1006136		7
~~A36~~	~~1003064-69~~		~~1006137~~		~~4~~
~~A36~~	~~1003064-71~~		~~1006137~~		~~5~~
A29	1003064-73	G	1006139		4
A29	1003064-75	G	1006139		5
A37	1003064-76	G	1006130	A	5
A36	1003064-77	G	1006137	A	4
A36	1003064-78	G	1006137	A	5
A18	1003064-88	G	1006122	A	4
A18	1003064-89	G	1006122	A	5
A22	1003064-90	G	1006133	A	4
A38	1003064-91	G	1006131	B	4
A17	1003064-92	G	1006123	C	5
A28	1003064-93	G	1006132	A	4
A28	1003064-94	G	1006132	A	5



REPLACES REV B WITH CHANGE

NOTES
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER ND 1002030
3.
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1006806-11	INSULATION TAPE, ELECTRICAL	4
AR	1006806-10	INSULATION TAPE, ELECTRICAL	3
AR	1006806-1	INSULATION TAPE, ELECTRICAL	2
AR	1006757-7	WIRE, ELECTRICAL .005 X .020	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082-	
1003081-	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DRAWN FW Pohl (IN) DATE 7 MAY 63
CHECKED
APPROVAL
APPROVAL
NASA APPROVAL 7/31/63
MIT APPROVAL 7/31/63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

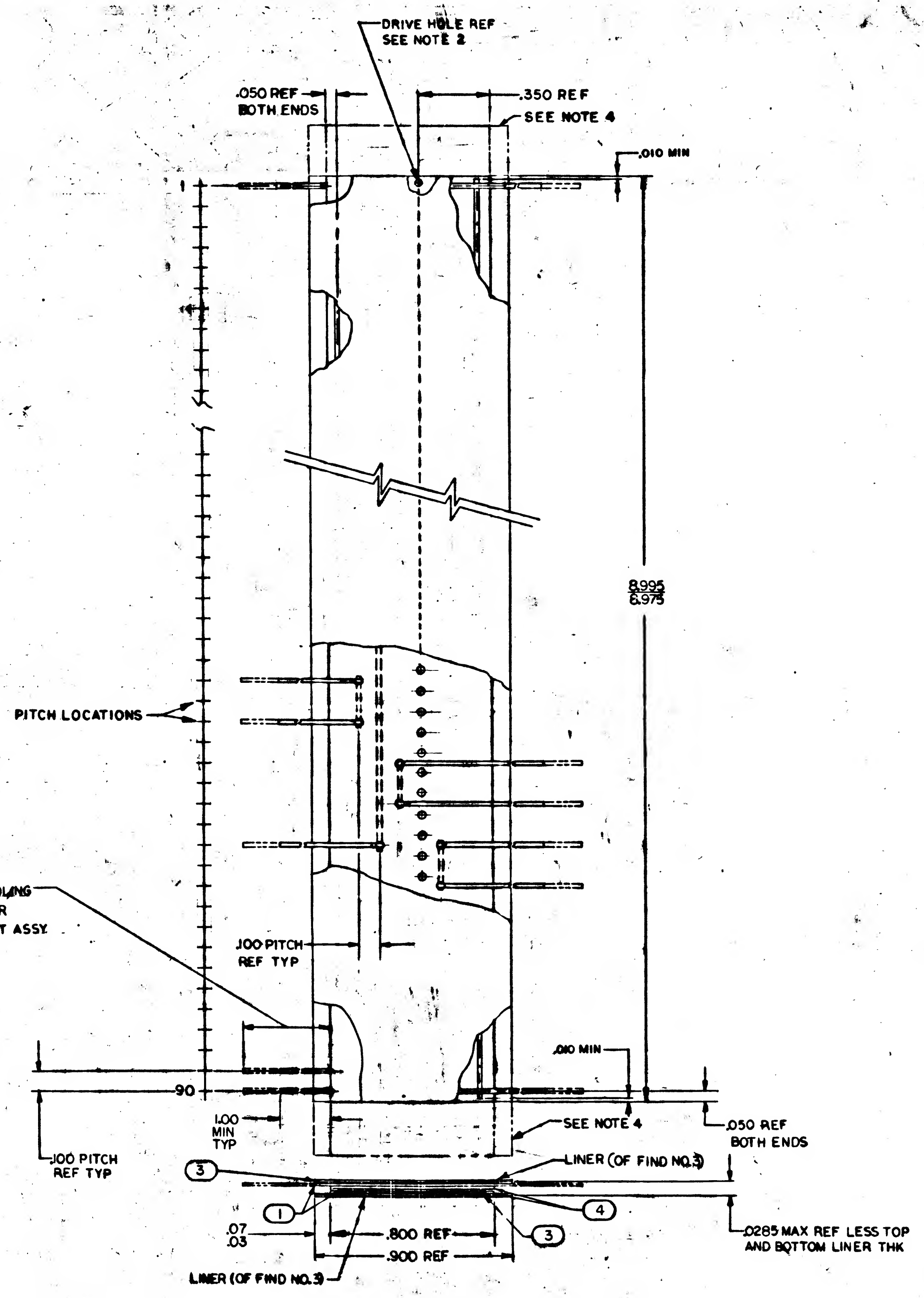
800 MATRIX ASSEMBLY
STICK (TAB)

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003064
SCALE 4/1
WT
SHEET 1 OF 1

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

MODULE NO.	PART NO	REV	SIGNAL WIRING DIAGRAM DRAWING NO	REV	MATRIX NO
A1-A16	1003064-1	J	1006120		4
A1-A16	1003064-3	J	1006120		5
A35	1003064-5	J	1006121		4
A35	1003064-7	J	1006121		5
~~A18~~	~~1003064-9~~		~~1006122~~		~~4~~
~~A18~~	~~1003064-11~~		~~1006122~~		~~5~~
A17	1003064-13	J	1006123		4
~~A17~~	~~1003064-15~~		~~1006123~~		~~5~~
A27	1003064-17	J	1006124		4
A27	1003064-19	J	1006124		5
A25	1003064-21	J	1006134		4
A25	1003064-23	J	1006134		5
A32	1003064-25	J	1006126		4
A32	1003064-27	J	1006126		5
A33-A34	1003064-29	J	1006127		4
A33-A34	1003064-31	J	1006127		5
A30-A31	1003064-33	J	1006128		4
A30-A31	1003064-35	J	1006128		5
A26	1003064-37	J	1006129		4
A26	1003064-39	J	1006129		5
A37	1003064-41	J	1006130		4
~~A37~~	~~1003064-43~~		~~1006130~~		~~5~~
~~A38~~	~~1003064-45~~		~~1006131~~		~~4~~
A38	1003064-47	J	1006131		5
~~A28~~	~~1003064-49~~		~~1006132~~		~~4~~
~~A28~~	~~1003064-51~~		~~1006132~~		~~5~~
~~A22~~	~~1003064-53~~		~~1006133~~		~~4~~
A22	1003064-55	J	1006133		5
A22	1003064-56	J	1006133		7
A23	1003064-57	J	1006125		4
A23	1003064-59	J	1006125		5
A24	1003064-61	J	1006135		4
A24	1003064-62	J	1006135		6
A24	1003064-63	J	1006135		5
A24	1003064-64	J	1006135		7
A21	1003064-65	J	1006136		4
A21	1003064-66	J	1006136		6
A21	1003064-67	J	1006136		5
A21	1003064-68	J	1006136		7
~~A36~~	~~1003064-69~~		~~1006137~~		~~4~~
~~A36~~	~~1003064-71~~		~~1006137~~		~~5~~
A29	1003064-73	J	1006139		4
A29	1003064-75	J	1006139		5
A37	1003064-76	J	1006130	A	5
A36	1003064-77	J	1006137	A	4
A36	1003064-78	J	1006137	A	5
A18	1003064-88	J	1006122	A	4
A18	1003064-89	J	1006122	A	5
A22	1003064-90	J	1006133	A	4
A38	1003064-91	J	1006131	B	4
A17	1003064-92	J	1006123	C	5
A28	1003064-93	J	1006132	A	4
A28	1003064-94	J	1006132	A	5

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGES PER TDRR 02290	7-31-63	
D	REVISED PER TDRR 03123	7-12-63	
E	REVISED PER TDRR 03438	9-26-63	
F	REVISED PER TDRR 03569	10-3-63	
G	REVISED PER TDRR 04025	12-16-63	
H	REVISED PEP TDRR 04385		
J	REVISED PER TDRR 04415		



VIEW SHOWN INCOMPLETE FOR CLARITY

REPLACES REV B WITH CHANGE

NOTES

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER ND 1000000
3.
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1006806-11	INSULATION TAPE, ELECTRICAL	4
AR	1006806-10	INSULATION TAPE, ELECTRICAL	3
AR	1006757-7	WIRE, ELECTRICAL .005 X .020	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082-	
1003081-	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DRAWN Pollini DATE 7 MAY 63
CHECKED
APPROVAL 7-29-63
APPROVAL 7/31/63
NASA APPROVAL 7/31/63
MIT APPROVAL 7/31/63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

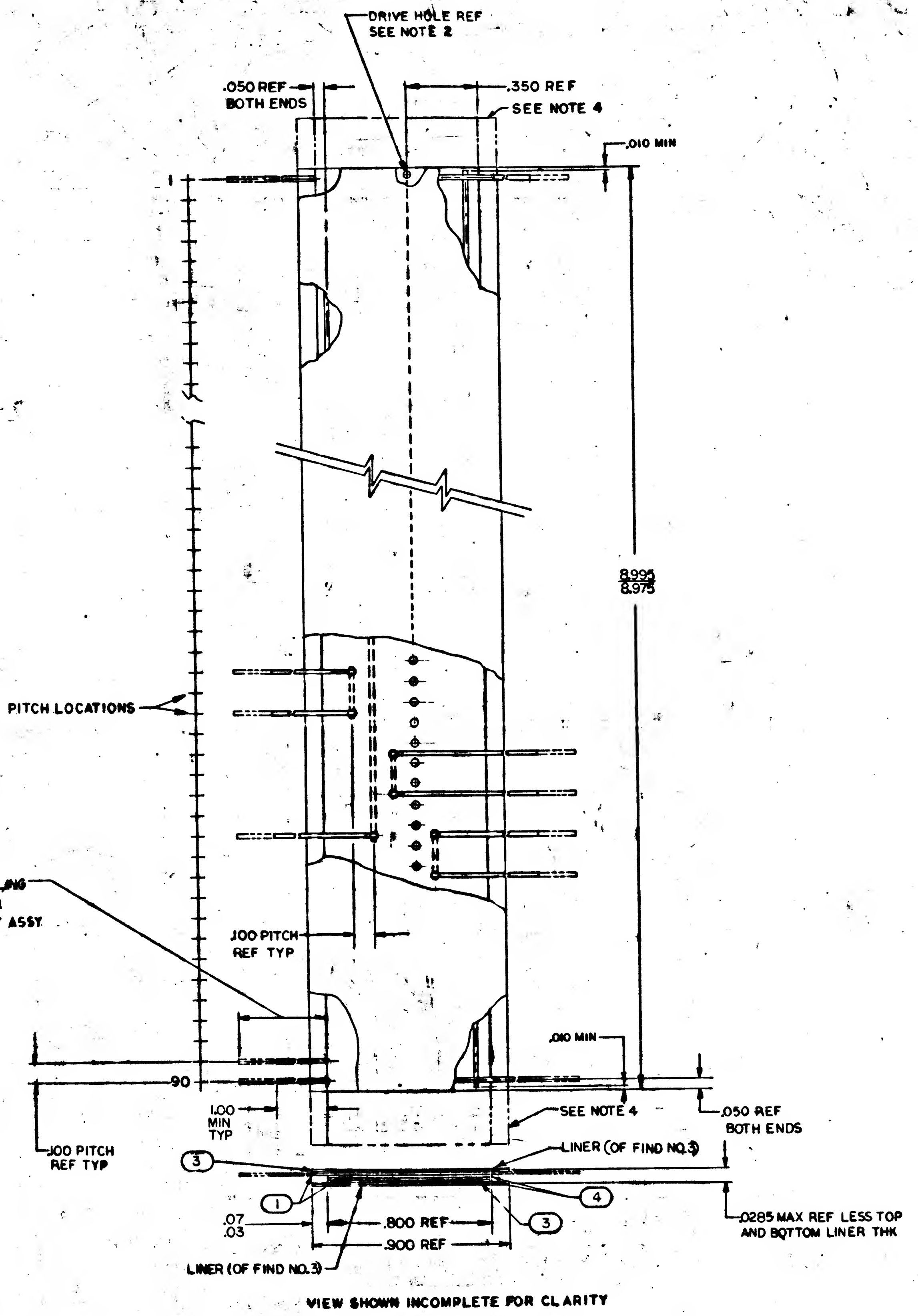
800 MATRIX ASSEMBLY
STICK (TAB)

CODE IDENT NO. — SIZE E NASA DRAWING NO. 1003064
SCALE 4/1 WT SHEET 1 OF 3

MASTER

MODULE NO.	PART NO	REV	SIGNAL WIRING DIAGRAM DRAWING NO	REV	MATRIX NO
A1-A16	1003064-1	J	1006120		4
A1-A16	1003064-3	J	1006120		5
A35	1003064-5	J	1006121		4
A35	1003064-7	J	1006121		5
~~A18~~	~~1003064-9~~		~~1006122~~		~~4~~
~~A18~~	~~1003064-11~~		~~1006122~~		~~5~~
A17	1003064-13	J	1006123		4
~~A17~~	~~1003064-15~~		~~1006123~~		~~5~~
A27	1003064-17	J	1006124		4
A27	1003064-19	J	1006124		5
A25	1003064-21	J	1006134		4
A25	1003064-23	J	1006134		5
A32	1003064-25	J	1006126		4
A32	1003064-27	J	1006126		5
A33-A34	1003064-29	J	1006127		4
A33-A34	1003064-31	J	1006127		5
A30-A31	1003064-33	J	1006128		4
A30-A31	1003064-35	J	1006128		5
A26	1003064-37	J	1006129		4
A26	1003064-39	J	1006129		5
A37	1003064-41	J	1006130		4
~~A37~~	~~1003064-43~~		~~1006130~~		~~5~~
~~A38~~	~~1003064-45~~		~~1006131~~		~~4~~
A38	1003064-47	J	1006131		5
~~A28~~	~~1003064-49~~		~~1006132~~		~~4~~
~~A28~~	~~1003064-51~~		~~1006132~~		~~5~~
~~A22~~	~~1003064-53~~		~~1006133~~		~~4~~
A22	1003064-55	J	1006133		5
A22	1003064-56	J	1006133		7
A23	1003064-57	J	1006125		4
A23	1003064-59	J	1006125		5
A24	1003064-61	J	1006135		4
A24	1003064-62	J	1006135		6
A24	1003064-63	J	1006135		5
A24	1003064-64	J	1006135		7
A21	1003064-65	J	1006136		4
A21	1003064-66	J	1006136		6
~~A21~~	~~1003064-67~~	J	~~1006136~~		~~5~~
A21	1003064-68	J	1006136		7
~~A36~~	~~1003064-69~~		~~1006137~~		~~4~~
~~A36~~	~~1003064-71~~		~~1006137~~		~~5~~
A29	1003064-73	J	1006139		4
A29	1003064-75	J	1006139		5
A37	1003064-76	J	1006130	A	5
A36	1003064-77	J	1006137	A	4
A36	1003064-78	J	1006137	A	5
A18	1003064-88	J	1006122	A	4
A18	1003064-89	J	1006122	A	5
A22	1003064-90	J	1006133	A	4
A38	1003064-91	J	1006131	B	4
A17	1003064-92	J	1006123	C	5
A28	1003064-93	J	1006132	A	4
A28	1003064-94	J	1006132	A	5
A21	1003064-95	K	1006136	B	5

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGES PER TDRR 02290	7/31	
D	REVISED PER TDRR 03123	7-12-63	
E	REVISED PER TDRR 03438	9-26-63	
F	REVISED PER TDRR 03561	10-3-63	
G	REVISED PER TDRR 04025	8-16-63	
H	REVISED PER TDRR 04385	[illegible]	
J	REVISED PER TDRR 04415	[illegible]	
K	REVISED PER TDRR 06315	2/6/64	



VIEW SHOWN INCOMPLETE FOR CLARITY

REPLACES REV B WITH CHANGE

NOTES
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER ND 1002030
3.
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1006806-11	INSULATION TAPE, ELECTRICAL	4
AR	1006806-10	INSULATION TAPE, ELECTRICAL	3
AR	1006757-7	WIRE, ELECTRICAL .005 X .020	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082-	
1003081-	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN PW POLLINI DATE 7 MAY 63
CHECKED
APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

800 MATRIX ASSEMBLY
STICK (TAB)

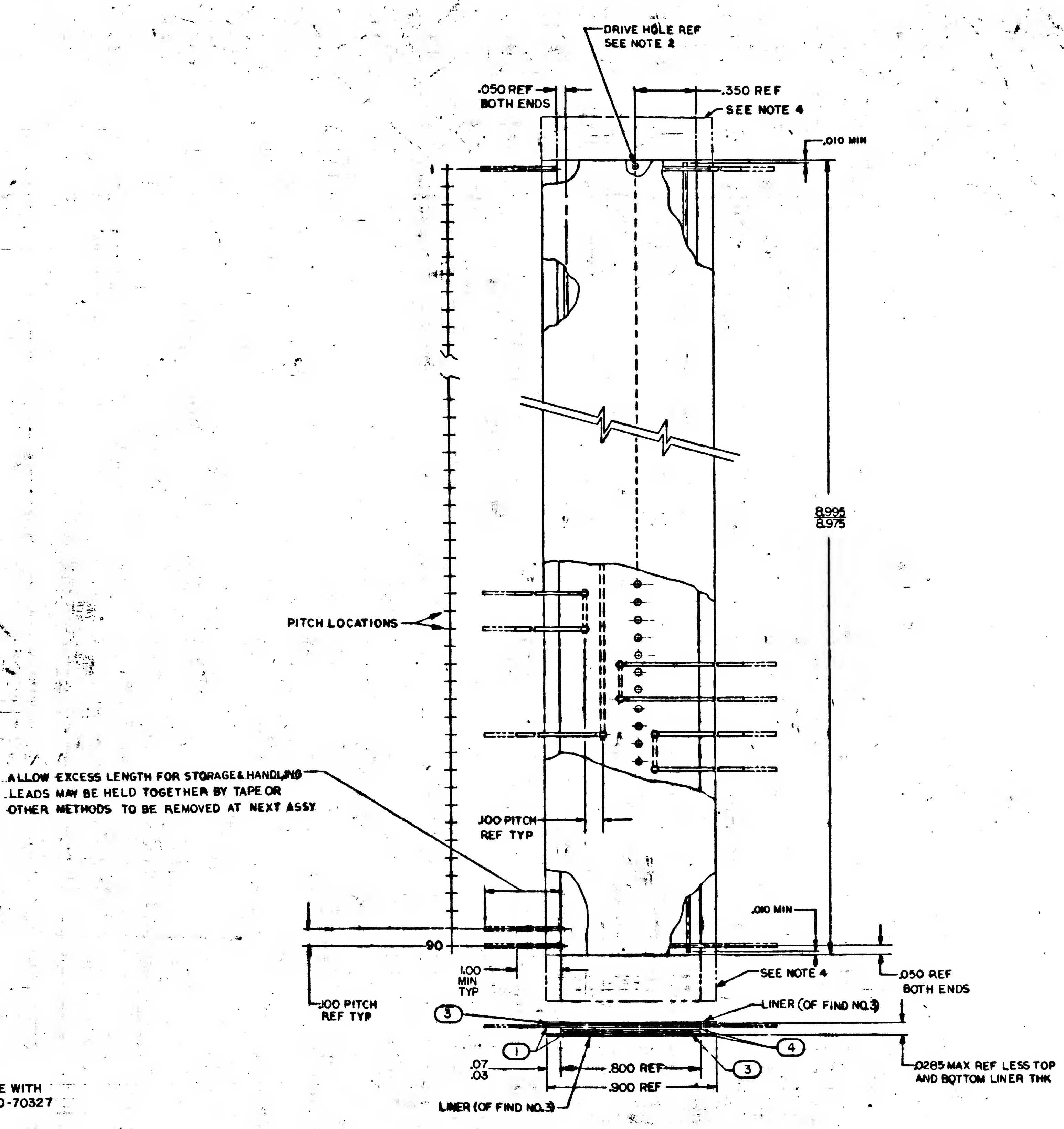
CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003064
SCALE 4/1
WT
SHEET 1 OF 1

MASTER

1003064 K

MODULE NO.	PART NO	REV	SIGNAL WIRING DIAGRAM		
			DRAWING NO	REV	MATRIX NO
A1-A16	1003064-1	J	1006120		4
A1-A16	1003064-3	J	1006120		5
A35	1003064-5	J	1006121		4
A35	1003064-7	J	1006121		5
~~A18~~	~~1003064-9~~		~~1006122~~		~~4~~
~~A18~~	~~1003064-11~~		~~1006122~~		~~5~~
A17	1003064-13	J	1006123		4
~~A17~~	~~1003064-15~~		~~1006123~~		~~5~~
A27	1003064-17	J	1006124		4
A27	1003064-19	J	1006124		5
A25	1003064-21	J	1006134		4
A25	1003064-23	J	1006134		5
A32	1003064-25	J	1006126		4
A32	1003064-27	J	1006126		5
A33-A34	1003064-29	J	1006127		4
A33-A34	1003064-31	J	1006127		5
A30-A31	1003064-33	J	1006128		4
A30-A31	1003064-35	J	1006128		5
A26	1003064-37	J	1006129		4
A26	1003064-39	J	1006129		5
A37	1003064-41	J	1006130		4
~~A37~~	~~1003064-43~~		~~1006130~~		~~5~~
~~A38~~	~~1003064-45~~		~~1006131~~		~~4~~
A38	1003064-47	J	1006131		5
~~A28~~	~~1003064-49~~		~~1006132~~		~~4~~
~~A28~~	~~1003064-51~~		~~1006132~~		~~5~~
~~A22~~	~~1003064-53~~		~~1006133~~		~~4~~
A22	1003064-55	J	1006133		5
A22	1003064-56	J	1006133		7
A23	1003064-57	J	1006125		4
A23	1003064-59	J	1006125		5
A24	1003064-61	J	1006135		4
A24	1003064-62	J	1006135		6
A24	1003064-63	J	1006135		5
A24	1003064-64	J	1006135		7
A21	1003064-65	J	1006136		4
A21	1003064-66	J	1006136		6
~~A21~~	~~1003064-67~~	~~J~~	~~1006136~~		~~5~~
A21	1003064-68	J	1006136		7
~~A36~~	~~1003064-69~~		~~1006137~~		~~4~~
~~A36~~	~~1003064-71~~		~~1006137~~		~~5~~
~~A29~~	~~1003064-73~~	~~J~~	~~1006139~~		~~4~~
A29	1003064-75	J	1006139		5
A37	1003064-76	J	1006130	A	5
A36	1003064-77	J	1006137	A	4
A36	1003064-78	J	1006137	A	5
A18	1003064-88	J	1006122	A	4
A18	1003064-89	J	1006122	A	5
A22	1003064-90	J	1006133	A	4
A38	1003064-91	J	1006131	B	4
A17	1003064-92	J	1006123	C	5
A28	1003064-93	J	1006132	A	4
A28	1003064-94	J	1006132	A	5
A21	1003064-95	K	1006136	B	5
A29	1003064-96	L	1006139	B	4

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGES PER TDRR 02290	[illegible]	
D	REVISED PER TDRR 03123	7-12-63	
E	REVISED PER TDRR 03438	9-26-63	
F	REVISED PER TDRR 03569	10-3-63	
G	REVISED PER TDRR 04025	10-16-63	
H	REVISED PEP TDRR 04385	[illegible]	
J	REVISED PER TDRR 04915	[illegible]	
K	REVISED PER TDRR 06315	2/7/64	
L	REVISED PER TDRR 06750	3/3/64	



VIEW SHOWN INCOMPLETE FOR CLARITY

REPLACES REV B WITH CHANGE

NOTES

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER ND 1002030
3.
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY

AR	1006806-11	INSULATION TAPE, ELECTRICAL	4
AR	1006806-10	INSULATION TAPE, ELECTRICAL	3
AR	1006757-7	WIRE, ELECTRICAL .005 X .020	1
QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082-	
1003081-	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DRAWN R W POLLINI DATE
CHECKED
APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

800 MATRIX ASSEMBLY
STICK (TAB)

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003064
SCALE 4/1
WT
SHEET 1 OF 1

MASTER

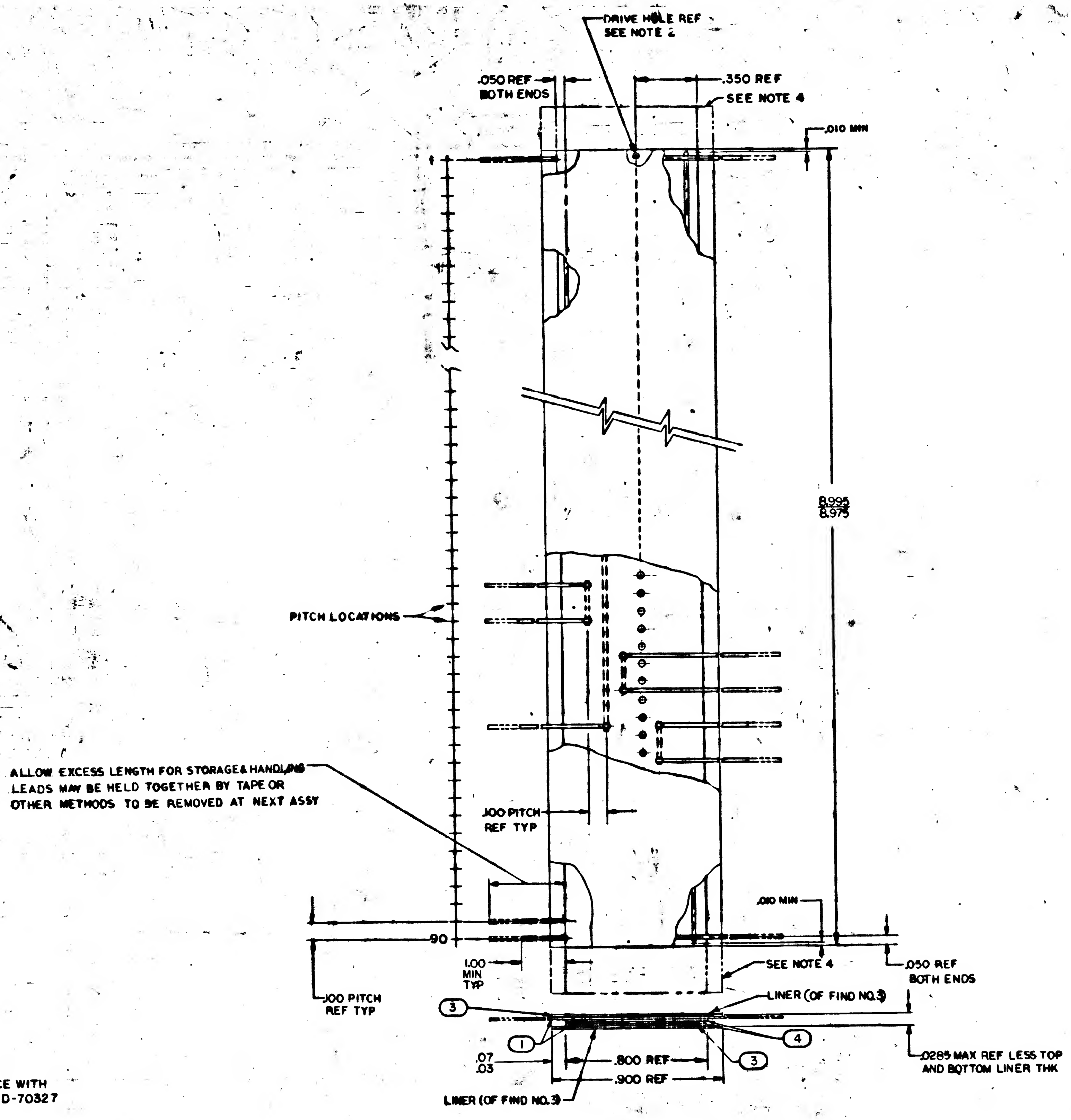
1003064 L

INCHES
PHOTOGRAPHING SCALE ONLY

MODULE NO.	PART NO	REV	SIGNAL WIRING DIAGRAM DRAWING NO	REV	MATRIX NO
A1-A16	1003064-1	J	1006120		4
A1-A16	1003064-3	J	1006120		5
A35	1003064-5	J	1006121		4
A35	1003064-7	J	1006121		5
~~A18~~	~~1003064-9~~		~~1006122~~		~~4~~
~~A18~~	~~1003064-11~~		~~1006122~~		~~5~~
A17	1003064-13	J	1006123		4
~~A17~~	~~1003064-15~~		~~1006123~~		~~5~~
A27	1003064-17	J	1006124		4
A27	1003064-19	J	1006124		5
A25	1003064-21	J	1006134		4
A25	1003064-23	J	1006134		5
A32	1003064-25	J	1006126		4
A32	1003064-27	J	1006126		5
A33-A34	1003064-29	J	1006127		4
A33-A34	1003064-31	J	1006127		5
A30-A31	1003064-33	J	1006128		4
A30-A31	1003064-35	J	1006128		5
A26	1003064-37	J	1006129		4
A26	1003064-39	J	1006129		5
A37	1003064-41	J	1006130		4
~~A37~~	~~1003064-43~~		~~1006130~~		~~5~~
~~A38~~	~~1003064-45~~		~~1006131~~		~~4~~
A38	1003064-47	J	1006131		5
~~A28~~	~~1003064-49~~		~~1006132~~		~~4~~
~~A28~~	~~1003064-51~~		~~1006132~~		~~5~~
~~A22~~	~~1003064-53~~		~~1006133~~		~~4~~
A22	1003064-55	J	1006133		5
A22	1003064-56	J	1006133		7
A23	1003064-57	J	1006125		4
A23	1003064-59	J	1006125		5
A24	1003064-61	J	1006135		4
A24	1003064-62	J	1006135		6
A24	1003064-63	J	1006135		5
A24	1003064-64	J	1006135		7
A21	1003064-65	J	1006136		4
A21	1003064-66	J	1006136		6
~~A21~~	~~1003064-67~~	~~J~~	~~1006136~~		~~5~~
A21	1003064-68	J	1006136		7
~~A36~~	~~1003064-69~~		~~1006137~~		~~4~~
~~A36~~	~~1003064-71~~		~~1006137~~		~~5~~
~~A29~~	~~1003064-73~~	~~J~~	~~1006139~~		~~4~~
~~A29~~	~~1003064-75~~	~~J~~	~~1006139~~		~~5~~
A37	1003064-76	J	1006130	A	5
A36	1003064-77	J	1006137	A	4
A36	1003064-78	J	1006137	A	5
A18	1003064-88	J	1006122	A	4
A18	1003064-89	J	1006122	A	5
A22	1003064-90	J	1006133	A	4
A38	1003064-91	J	1006131	B	4
A17	1003064-92	J	1006123	C	5
A28	1003064-93	J	1006132	A	4
A28	1003064-94	J	1006132	A	5
A21	1003064-95	K	1006136	B	5
A29	1003064-96	L	1006139	B	4
A29	1003064-97	M	1005761	—	4
A29	1003064-98	M	1005761	—	5

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGES PER TDRR 02290	7/31	
D	REVISED PER TDRR 03123	9-12-63	
E	REVISED PER TDRR 03438	9-26-63	
F	REVISED PER TDRR 03569	10-3-63	
G	REVISED PER TDRR 04025	12-16-63	
H	REVISED PEP TDRR 04383		
J	REVISED PER TDRR 04415		
K	REVISED PER TDRR 06315	2/10/64	
L	REVISED PER TDRR 06750	3/3/64	
M	REVISED PER TDRR 6353 DR [illegible] CHK [illegible]	3/24/64	



VIEW SHOWN INCOMPLETE FOR CLARITY

REPLACES REV B WITH CHANGE

NOTES
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. FABRICATE PER ND 1002030
3.
4. INDICATED MATERIAL IS USED FOR HANDLING PURPOSES ONLY AND IS TO BE REMOVED AT NEXT ASSEMBLY

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1006806-11	INSULATION TAPE, ELECTRICAL	4
AR	1006806-10	INSULATION TAPE, ELECTRICAL	3
AR	1006757-7	WIRE, ELECTRICAL .005 X .020	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003814	
1003813	
1003082-	
1003081-	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DRAWN R W POLLINI DATE 3 MAY 63
CHECKED
APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

800 MATRIX ASSEMBLY
STICK (TAB)

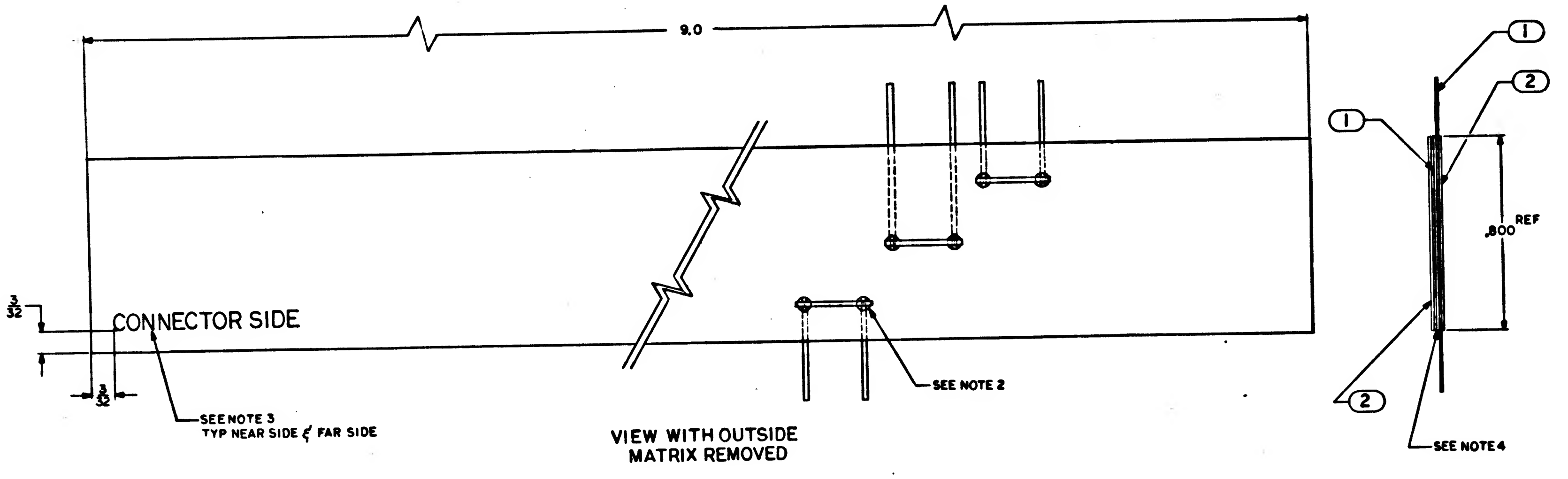
CODE IDENT NO. — SIZE E NASA DRAWING NO. 1003064
SCALE 4/1 WT SHEET 1 OF 1

MASTER

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00514 DATE 6 Mar 63

STICK IDENTIFICATION	WIRING MATRIX DIAGRAM	PART DASH NO. MATRIX 4	PART DASH NO. MATRIX 6	PART DASH NO. MATRIX 5	PART DASH NO. MATRIX 7
ARITHMETIC STICK	1006075	1003064-1	————	1003064-3	————
		-5			

NOTES:—
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS BY MIL-[70327
2. WELD PER ND 100- 3
3. STENCIL 3/32 HIGH BLACK LETTERS AS SHOWN
4. TAPE, (DOUBLE SIDED ADHESIVE) PROGRAMED PER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
2	1004081-5	INSULATION, MYLAR	2
AR	1006757-7	.005 X .020 WIRE, ELECTRICAL	1

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ±.010 ANGLES ± #
DO NOT SCALE THIS DRAWING
MATERIAL #
HEAT TREATMENT #
FINAL FINISH #

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO CONTRACT
DRAWN DATE 12/7/62
CHECKED 3/5/63
APPROVAL W. Turner 3/5/63
APPROVAL 3/1/63
NASA APPROVAL Jack Barnard
MIT APPROVAL 6 Mar 63

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.800 MATRIX ASSEMBLY
STICK (TAB)

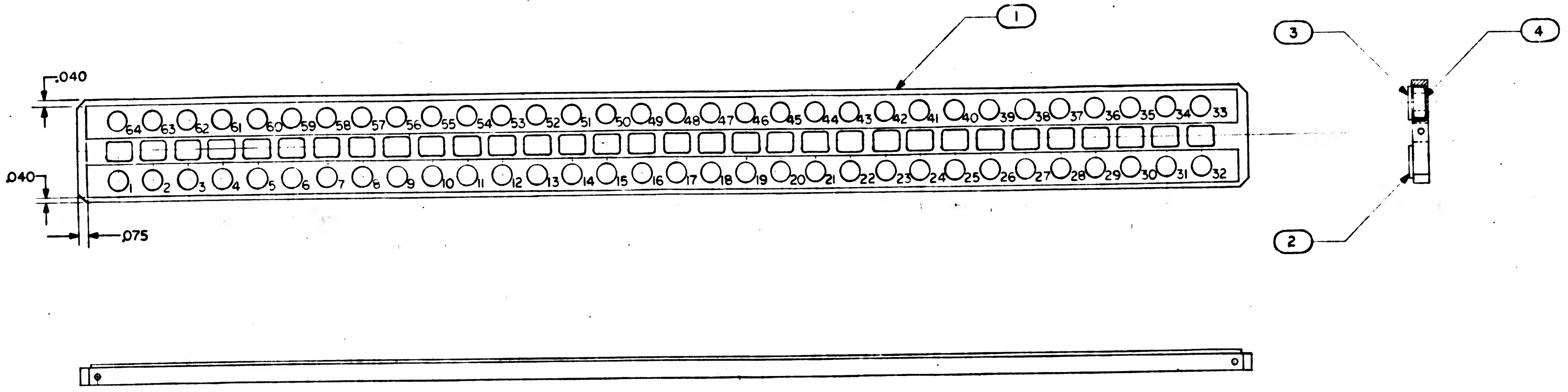
CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003064
SCALE 4/1 WT # SHEET 1 OF 1

MASTER

1003064

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00896 **DATE** 4-17-63

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. BOND FIND NO. 2 AND FIND NO. 3 TO FIND NO. 1 PER ND1002004
3. STAKE FIND NO. 4 TO FIND NO. 1 PER ND1002009

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
64	1006773	CORE	4
1	1004085-2	MYLAR FILM	3
1	1004085-1	MYLAR FILM	2
1	1004082	ROPE CHANNEL	1

LIST OF MATERIALS

1003062	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ±.010 ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN E. O'Connell DATE 12-10-62
CHECKED J. Marston 16 APR 63
APPROVAL W B Turner 16 APR 63
APPROVAL
NASA APPROVAL
MIT APPROVAL W Kupfer 17 Apr 63

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HOUSTON, TEXAS

ROPE CHANNEL ASSEMBLY

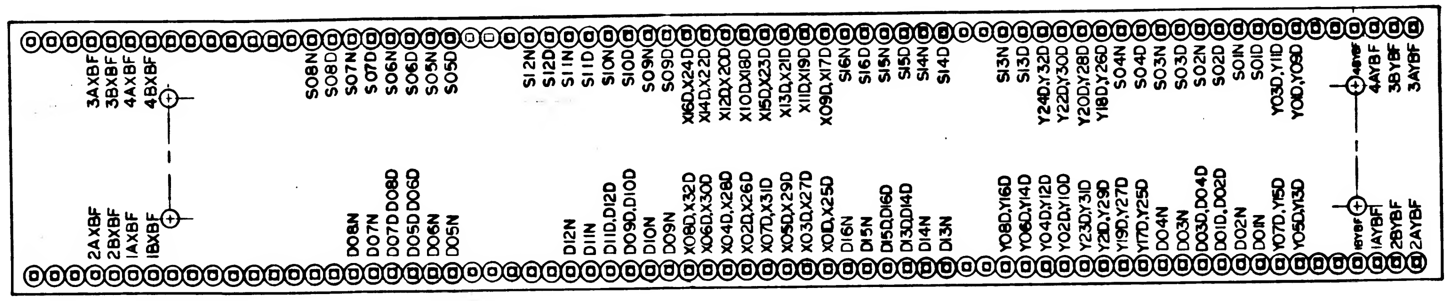
CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003065
SCALE 2/1
WT
SHEET 1 OF 1

INCHES 0 1 2
PHOTOGRAPHIC SCALE ONLY

1003065

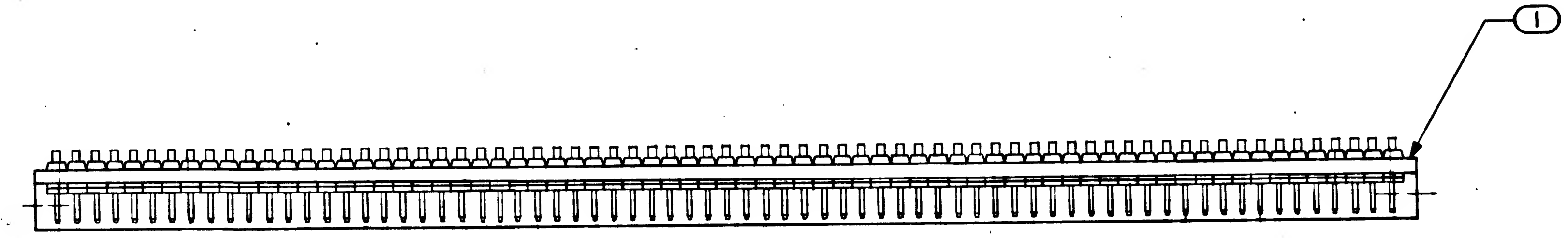
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

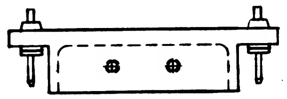
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00393	2-5-63	WR



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00309 DATE 30 Jan 1963





NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. SILK SCREEN WHITE CHARACTERS AS SHOWN PER MIL-STD-130 (REF SILK SCREEN MASTER DWG 1004089)

MASTER

1	1003077	HEADER ASSEMBLY	1
QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

1003068	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS DE ANGLES
± ± ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT
DRAWN A. Dempski DATE 12/10/62
CHECKED 12/3/62
APPROVAL W.B. Turner 28 JAN 63
APPROVAL 30 Jan 63
NASA APPROVAL W.J. Rhine 1-30-63
MIT APPROVAL 30 Jan 63

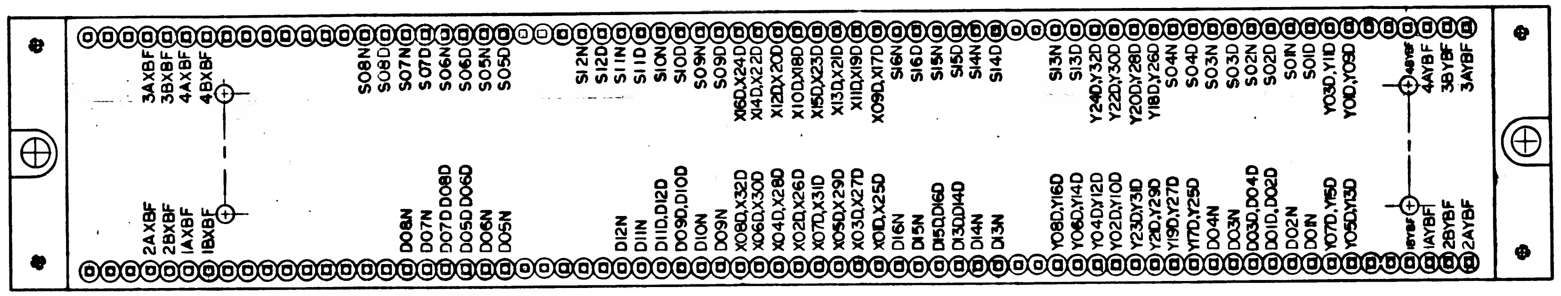
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

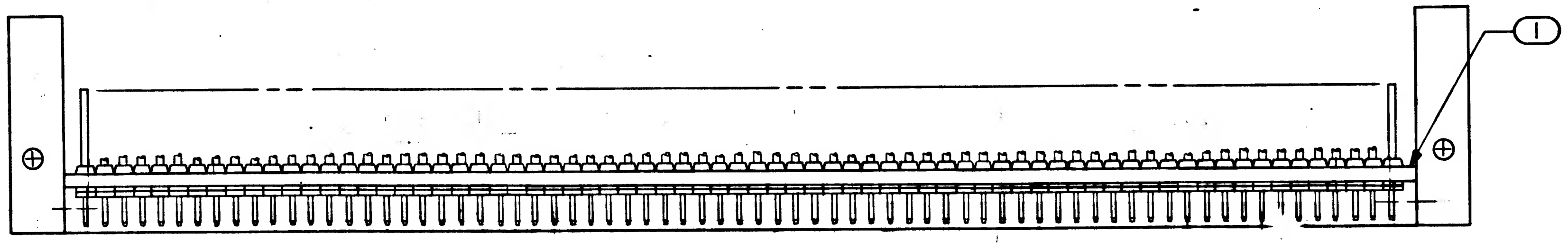
HEADER ASSEMBLY
MARKING
ERASABLE MEMORY STICK

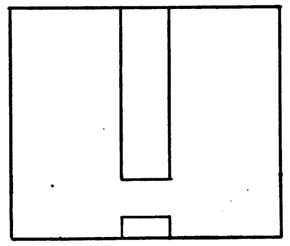
CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003066
SCALE 2/1
WT
SHEET 1 OF 1

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00393	2-5-63	WR
B	REVISED AND UPGRADED FOR CLASS A RELEASE 01523	7-8-63	







NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. MARK WHITE CHARACTERS AS SHOWN PER ND1002019 (REF SILK SCREEN MASTER DWG 1004089)

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
1	1003077	HEADER ASSEMBLY	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003068	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN DATE 12/10/62
CHECKED 12/31/62
APPROVAL W B Turner 28 JAN 63
APPROVAL 28 Jan 63
NASA APPROVAL W J Rhine 1-30-63
MIT APPROVAL 30 Jan 63

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HOUSTON, TEXAS

HEADER ASSEMBLY MARKING
ERASABLE MEMORY STICK

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003066
SCALE 2/1
WT
SHEET 1 OF 1

1003066 B

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

8 7 6 5 4 3 2 1

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

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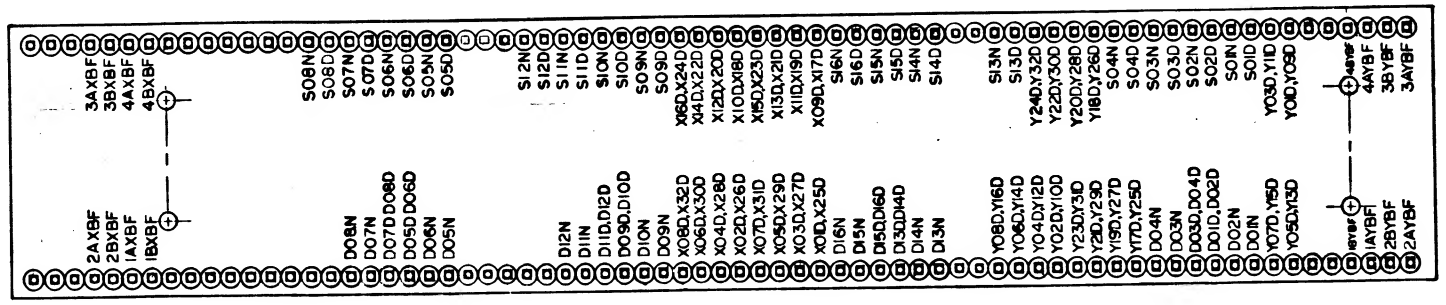


D

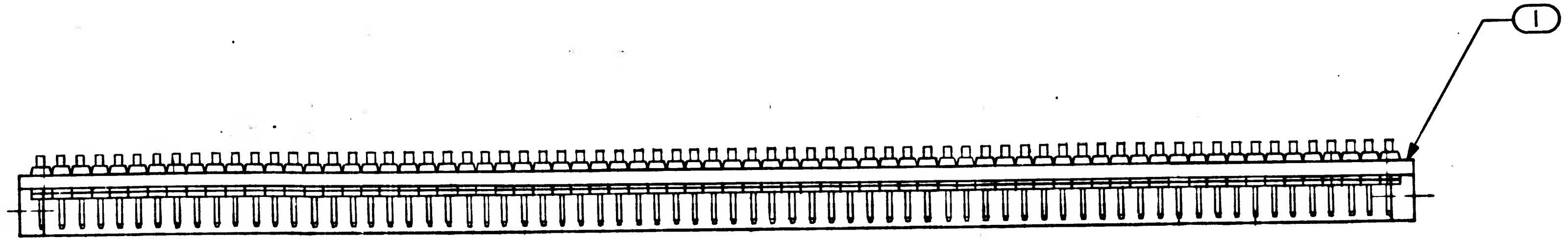
C

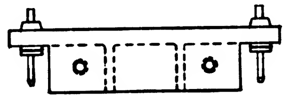
B

A

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00309 DATE 30 Jan 1963





1003066

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. SILK SCREEN WHITE CHARACTERS AS SHOWN PER MIL-STD-130 (REF SILK SCREEN MASTER DWG 1004089)

MASTER

1	1003077	HEADER ASSEMBLY	1
QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

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INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT
DRAWN A. Dimpekis DATE 12/10/62
CHECKED 12/3/62
APPROVAL W.B. Turner 28 JAN 63
APPROVAL 28 Jan 63
NASA APPROVAL W J Rhine 1-30-63
MIT APPROVAL W Kupfer 30 Jan 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

HEADER ASSEMBLY
MARKING
ERASABLE MEMORY STICK

CODE IDENT NO. SIZE D NASA DRAWING NO. 1003066
SCALE 2/1 WT SHEET 1 OF 1

8 7 6 5 4 3 2 1

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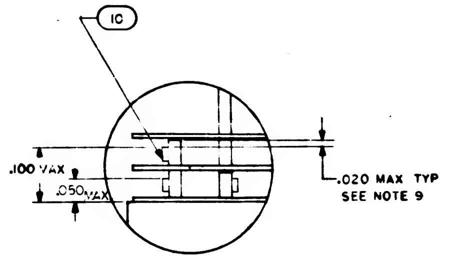
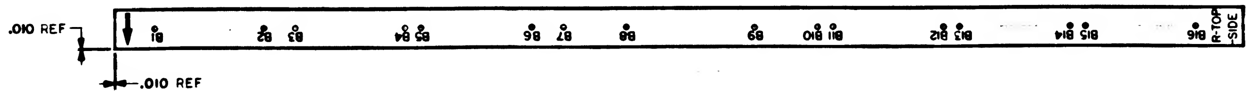
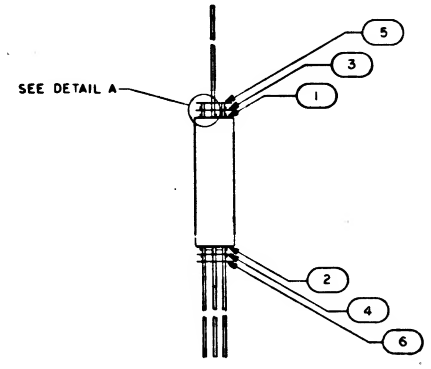
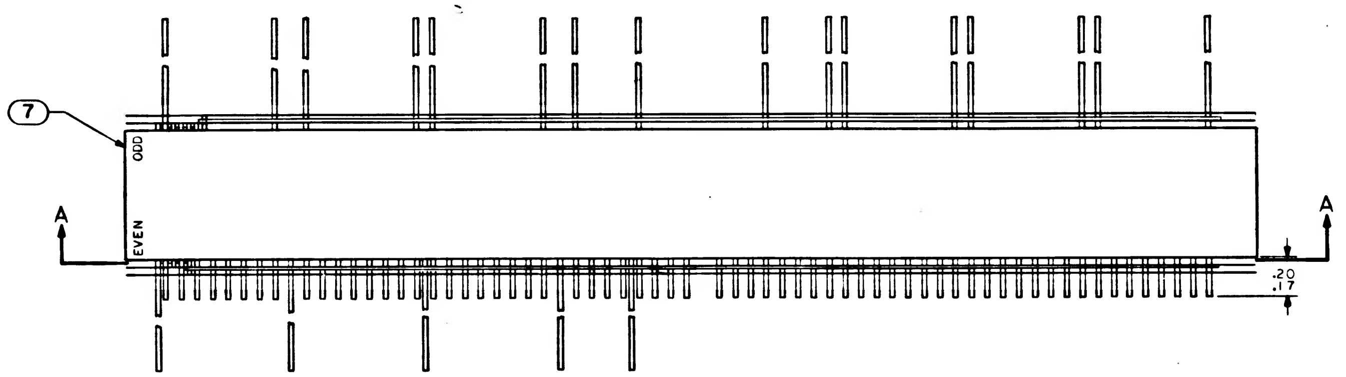
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL



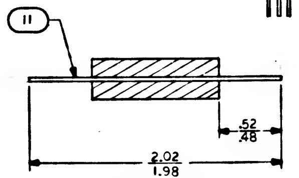
DETAIL A
SCALE 10/1



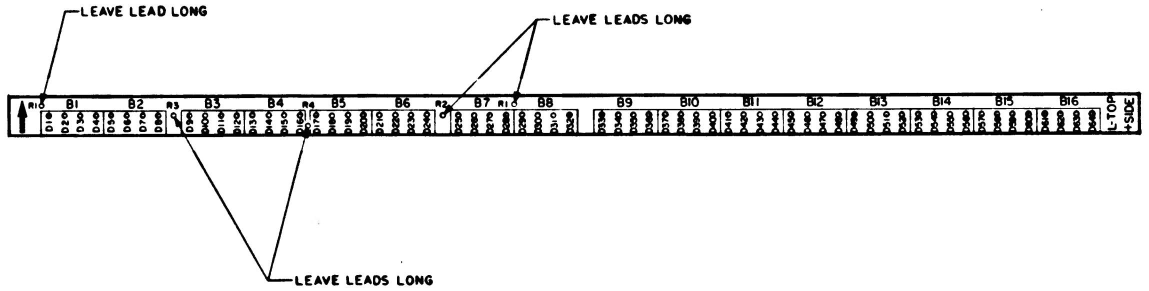


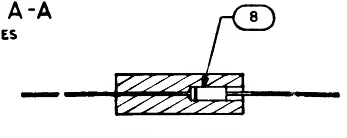


ALL WIRING NOT SHOWN FOR CLARITY

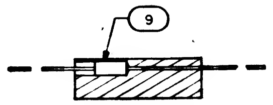


SECTION A-A
37 PLACES

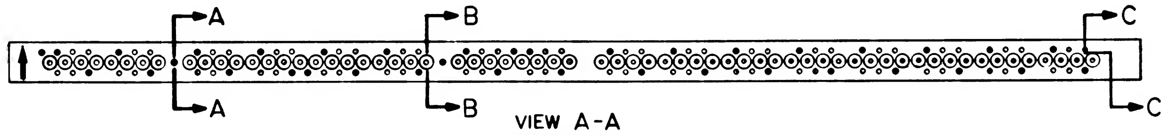




SECTION B-B
64 PLACES



SECTION C-C
64 PLACES



VIEW A-A
MYLAR REMOVED
(SEE NOTES 2,3 AND 4)

FOR INFORMATION ONLY
CLASS B RELEASE TDR No. 00896 DATE 4-17-63

NOTES
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ◎ DENOTES SILICON DIODE PER FIND NO. 8 IN VIEW B-B
3. ○ DENOTES 1/4 W RESISTOR PER FIND NO. 9 IN VIEW C-C
4. ● DENOTES FEEDTHRU WIRE PER FIND NO. 11 IN VIEW A-A
5. ASSEMBLE FIND NO. 1 AND FIND NO. 2 TO FIND NO. 7 AND WIRE PER DWG 1004080-1 AND 1004080-2
6. WELD PER ND 1002005
7. ASSEMBLE FIND NO. 3 AND FIND NO. 4 TO FIND NO. 7 AND WIRE PER DWG 1004080-3 AND 1004080-4
8. ASSEMBLE FIND NO. 5 AND FIND NO. 6 TO FIND NO. 7
9. ▲ ON FIND NO. 1 THRU FIND NO. 4 DENOTES LEADS TO BE CUT .010/.020 BEYOND WELD
10. ■ ON FIND NO. [illegible] DENOTES LEAD TO BE CUT .010/.020 BEYOND INSULATOR

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
☒	1006091	SCHEMATIC	REF
AS REQ'D	1006787-3	WIRE, ELECT	11
AS REQ'D	1006757-1	.010 X .020 WIRE, ELECTRICAL	10
64	1006750-56	RESISTOR 1/4 W ± 5%	9
64	1006751	DIODE, SILICON	8
1	1004079	DIODE BLOCK	
1	1004080-6	MYLAR FILM, DIODE BLOCK	
1	1004080-5	MYLAR FILM, DIODE BLOCK	
1	1004080-4	MYLAR FILM, DIODE BLOCK	
1	1004080-3	MYLAR FILM, DIODE BLOCK	
1	1004080-2	MYLAR FILM, DIODE BLOCK	
1	1004080-1	MYLAR FILM, DIODE BLOCK	

LIST OF MATERIALS

NEXT ASSY	USED ON
1003060	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO
CONTRACT
DRAWN J. Falzone DATE 11 DEC 62
CHECKED 12 DEC 62
APPROVAL 16 APR 63
APPROVAL
NASA APPROVAL
MIT APPROVAL 17 Apr 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

DIODE BLOCK ASSEMBLY
ROPE MEMORY STICK

CODE IDENT NO
SIZE E
NASA DRAWING NO. 1003067
SCALE 2/1
WT
SHEET 1 OF 1

INCHES
PHOTOGRAPHIC SCALE ONLY

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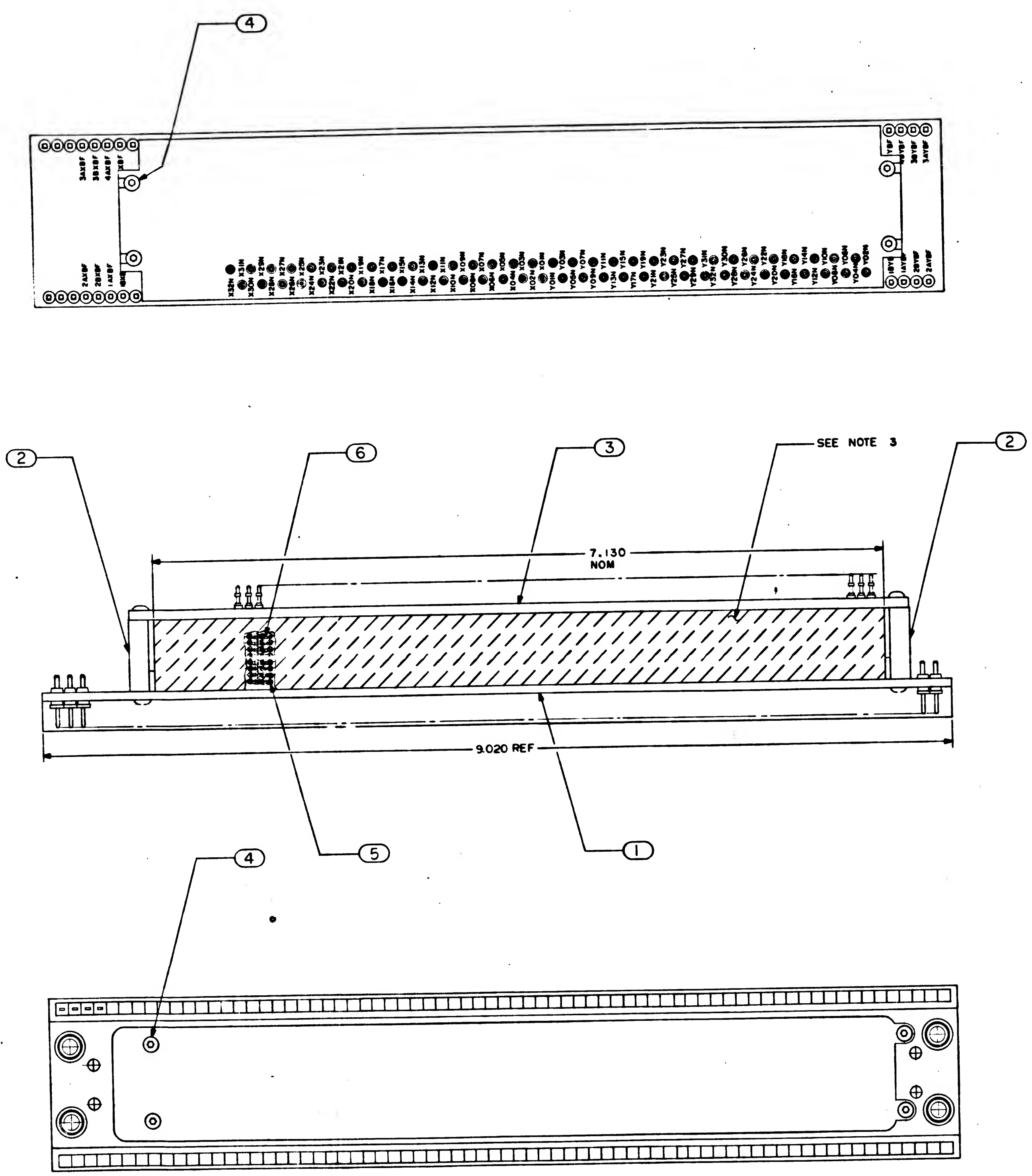
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00395	2-8-63	



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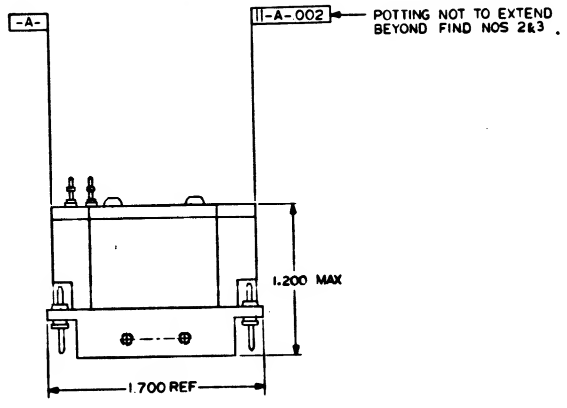
CLASS B RELEASE TDR No. 00309 DATE 30 Jan 1963



POTTING NOT TO EXTEND BEYOND FIND NOS 2&3.

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ASSEMBLE PER
3. ENCAPSULATE PER
4. TEST PER

MASTER

QTY REQD	PART IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
A R		WIRE, ELECTRICAL	6
16,384	1006786	FERRITE CORE	5
8	1006783-10	2-56 UNC BUTTON HD SOCKET SCREW	4
1	1003071	FEED THRU TERM PLATE SUB ASSY	3
2	1004086	END PLATE	2
1	1003066	HEADER ASSEMBLY MARKING	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003069	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO
CONTRACT
DRAWN DATE 12/10/62
CHECKED 12/31/62
APPROVAL 28 Jan 63
APPROVAL 29 Jan 63
NASA APPROVAL 1-30-63
MIT APPROVAL 30 Jan 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY
CORE STACK
ASSEMBLY

CODE IDENT NO
SIZE E
NASA DRAWING NO. 1003068
SCALE 2/1
WT
SHEET 1 OF 1

1003068

APOLLO G & N Specification
PS 1003068A
Date 23 August 63
Class A - Release
TDRR 02891

PROCUREMENT SPECIFICATION
FOR
ERASABLE MEMORY CORE STACK

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approval	
				MIT	NASA
29 SEPT. 64	A	13154	All	WK	WJR

This specification consists of i to iii and 1 to 8 inclusive.

APOLLO G & N Specification
PS 1003068A
Date ~~19 June 1964~~
29 SEPT. ~~1964~~ REV A

PROCUREMENT SPECIFICATION FOR ERASABLE MEMORY CORE STACK

The purpose of this document is to establish the manufacturing and test requirements for the procurement of ERASABLE MEMORY CORE STACKS for use in Apollo Guidance and Navigation Equipment.

W Kupfer 30 Sep 64
MIT/IL DATE

W J Rhine 9-30-64
NASA/MSC DATE

APOLLO G & N Specification
PS 1003068A
Date ~~19 June 1964~~
29 SEPT. 1964 REV A

PREPARED BY **TITLE** **DATE**

Frank Goddard Mgr. Eng. Specs. & Stds. 1 July 1964
RAYTHEON

EXAMINED BY **TITLE** **DATE**

J. G. Walsh Rel. Eng. 1 July 1964
RAYTHEON

EXAMINED BY **TITLE** **DATE**

Elec. Eng. 23 July 1964
RAYTHEON

EXAMINED BY **TITLE** **DATE**

W E Lund Proj. Eng., AGC 27 July 64
RAYTHEON

APPROVED BY **TITLE** **DATE**

D J Duggan Assistant Director 9/29/64
MIT/IL

APPROVED BY **TITLE** **DATE**

MIT/IL

APPROVED BY **TITLE** **DATE**

W Kupfer CCB 30 Sep 64
MIT/IL

INCHES
0 1 2

APOLLO G & N Specification
PS 1003068A
~~19 June 1964~~
29 SEPT. 1964 REV A

PROCUREMENT SPECIFICATION
FOR
ERASABLE MEMORY CORE STACK

1. SCOPE

1-1 PURPOSE. This specification establishes the requirements for the procurement of ERASABLE MEMORY CORE STACKS hereafter called ERASABLE MEMORY.

2. APPLICABLE DOCUMENTS

2-1 EFFECTIVE ISSUES. The following documents of the issue in effect on the date of invitation for bids form a part of this specification to the extent specified herein.

SPECIFICATIONS

NASA -

ND 1002009	Process for Staking and/or Embedding Electronic Components or Assemblies with Silicone Rubber, Various Methods
ND 1002071	Process Specification, Soldering of Electrical Connections
ND 1002151	Bonding of Silicone Rubber
ND 1002215	Mechanical and Electrical Items, Preparation for Delivery of, General Requirements
NPC 200-2	Quality Program Provisions for Space System Contractors
NPC 200-3	Inspection System Provisions for Suppliers of Space Materials, Parts, Components and Services

STANDARDS

Military

MIL-STD-202	Test Methods for Electrical and Electronic Component Parts

MIL-STD-810	Environmental Test Methods for Aerospace and Ground Equipment

DRAWINGS

1003068	Erasable Memory Core Stack
1003077	Header Assembly
1010718	Primer, Adhesive, Air Drying Silicone Rubber
1006050	X & Y Line Wiring Diagram
1006051	X & Y Line Information Drawing
1006056	Sense & Inhibit Wiring

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer).

2-2 CONFLICTING REQUIREMENTS. In the event of conflict between the requirements of the contract, this document, and the documents listed in this section, the documents shall govern in that order.

3. REQUIREMENTS

The requirements of this specification are classified under two headings: (1) General Requirements, are defined in paragraph 3.2; (2) Performance and Product Characteristics are defined in paragraph 3.3.

3-1 DESCRIPTION. The ERASABLE MEMORY is a coincident-current ferrite core array with a total capacity of 1,024 sixteen-bit words in which stored information may be altered or updated but readout is destructive in that word locations are cleared when they are read.

3-2 GENERAL REQUIREMENTS.

3-2.1 Qualification Test. When specified by the procuring activity, a representative sample of Erasable Memories shall be manufactured using the methods and procedures proposed for the production lot. These shall be submitted to the NASA Inspector for qualification test, at an activity designated in the contract or by the procuring activity.

These qualification tests are conducted to determine whether or not the Erasable Memories are being produced in compliance with the requirements of the contract, specification, and drawings. Failure of the Erasable

Memories to meet these requirements may result in disqualification of the contractor as determined by NASA or the purchaser.

Further production of the item by the contractor prior to approval by the procuring activity or the completion of the preproduction tests shall be at the contractor's risk. Requalification will be required at the discretion of NASA or the purchaser in the event that: (a) the contractor has modified the item, (b) the contractor has instituted a change in the material used or in his processing, or (c) the specification requirements for the item have been amended or revised sufficiently to affect the character of the item.

The qualification tests will be conducted in accordance with the procedures specified in section 4 of this specification.

3-2.2 Requalification Test. When specified by the procuring activity, the contractor shall submit one or more Erasable Memories to be selected from each production lot by the procuring activity for submission to a designated testing activity to determine compliance of the sample (s) with the requirements of the contract, specification, and drawings.

3-2.3 Materials and Construction. The materials used in fabricating the Erasable Memories shall be in strict accordance with drawing 1003068 and specifications referenced herein. Substitute materials shall be selected of such quality as to ensure that the equipment will meet the requirements of this specification and shall be subject to prior approval of the purchaser.

3-2.4 Weight, Dimensions, Finish, and Marking. The weight, dimensions, finish, and marking of the Erasable Memories shall comply with the requirements specified herein or on the applicable drawings.

3-2.5 Workmanship. The fabrication and finish of the Erasable Memories, its assemblies, subassemblies and parts shall be such as to produce a unit free from any defect that would affect proper functioning in service.

3-3 PERFORMANCE AND PRODUCT CHARACTERISTICS. The following requirements are stated to inform the contractor of specific characteristics and of the goals that were considered in the design. Inclusion of this information shall not be construed by the contractor as authorization to modify the design.

If the design of any part is not completely specified by the contractual documents, the contractor may submit a suggested design document for approval which will support these requirements.

If, in the opinion of the contractor, any design or testing shall impose undue time delay or expense, he shall so state, in detail, in a counterproposal, substantiating all contributing factors when submitting a bid, proposal, or change request in connection with this specification.

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PHOTOGRAPHIC SCALE

Requests for changes to or deviations from this specification or applicable drawings, specifications, publications, materials, or processes specified herein shall be accompanied by written justification.

3-3.1 Functional Characteristics. **Erasable Memories shall perform the following functions:**

3-3.1.1 Erasable Memory outputs shall meet the requirements specified in Table I when tested in accordance with the requirements of paragraph 4-2.1 at each of the following temperatures;

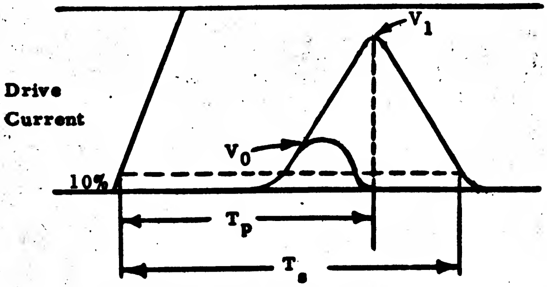
$0^\circ C \pm 1^\circ C$

$25^\circ C \pm 1^\circ C$

$70^\circ C \pm 1^\circ C$

Table I

	0°C	25°C	70°C
V_1 (mv)	48 min	42 min	30 min
V_0 (mv)	18 max	18 max	20 max
T_s (μ sec)	1.30 to 1.50	1.30 to 1.50	1.40 to 1.60
T_p (μ sec)	0.70 to 0.85	0.70 to 0.85	0.70 to 0.85



3-3.2 Environmental Characteristics.

3-3.2.1 Vibration. The Erasable Memory shall be capable of withstanding the vibration test specified in paragraph 4-2.2.1.

3-3.2.2 Shock. The Erasable Memory shall be capable of withstanding the shock test specified in paragraph 4-2.2.2.

3-3.2.3 Thermal Cycling. The Erasable Memory shall be capable of withstanding 5 thermal cycles specified in paragraph 4-2.2.3.

3-3.3 Service Life.

3-3.3.1 Operating Life. The Erasable Memory design is intended to meet performance specifications for at least 5000 hours of operation, excluding the contractors test time of the complete unit.

3-3.3.3 Shelf Life. The Erasable Memory design is intended to have a shelf life of at least 5 years, without operation, at ambient room temperature after final acceptance at the contractors plant.

3-3.4 Design Characteristics

3-3.4.1 Interchangeability. Unless otherwise specified, the Erasable Memory and its component parts shall be physically and functionally interchangeable without selection or fitting.

3-3.4.2 Soldering. Soldering shall conform to the requirements of ND 1002071. A minimum of one and one-half (1 1/2) turns of wire shall be left unsoldered around the terminals of the header assembly, drawing 1003077.

3-3.4.3 Encapsulation. All metal surfaces shall be suitably primed per ND 1002151 using material per drawing 1010718, or equivalent, and vacuum encapsulated using method F of ND 1002009.

3-3.4.4 Wiring Continuity. X and Y wires shall be continuous throughout the sixteen (16) digit planes. Sense and inhibit shall be continuous in each digit plane. No splices are allowed.

3-3.4.5 Wiring & Folding. Wiring and folding core arrays shall be in accordance with drawings 1006050, 1006051, and 1006056.

4. QUALITY ASSURANCE PROVISIONS

4-1 GENERAL. Unless otherwise specified herein, the contractor is responsible for the performance of all inspection requirements prior to submission for NASA inspection and acceptance. Except as otherwise specified, the contractor may utilize his own facilities or any commercial laboratory acceptable to NASA. Inspection records of the examinations and tests shall be kept complete and available to NASA as specified in the contract or order. NASA document NPC 200-2, Quality Program Provisions for Space System Contractors applies to the contractor's performance tier.

4-1.1 Acceptance Tests. These tests shall be accomplished on each Erasable Memory being submitted for acceptance under the contract. Acceptance test data on each unit accepted must accompany shipment to the purchaser. Acceptance tests shall be witnessed by the cognizant government inspector, a representative of the purchaser, or as the purchaser may direct in the procurement order. These tests are detailed in paragraph 4-2. Failure of the Erasable Memory to comply with these requirements shall result in rejection of the item or lot of items.

4-1.2 Qualification and Requalification Tests. Qualification and requalification tests shall be accomplished at a NASA - designated activity as specified in NASA Document NPC 200-2, Quality Program Provisions for Space System Contractors or NPC 200-3, Inspection System Provisions for Suppliers of Space Materials, Parts, Components and Services. These tests, as specified in paragraph 4-3, shall be conducted after the award of the contract to determine that the product will meet all specified requirements.

Failure of the Erasable Memory to comply with these requirements shall result in the rejection of the lot or the cessation of production, as determined by the procuring activity.

4-1.3 Test Conditions. Unless otherwise specified herein, the Erasable Memory shall be subjected to tests under the following ambient conditions:

Temperature	25 ± 10°C
Relative Humidity	Not More Than 90%
Barometric Pressure	28 to 32 inches Hg

4-2 ACCEPTANCE TESTS. Acceptance and inspection shall be 100% unless otherwise specified.

4-2.1 Functional Characteristics. Functional characteristics specified in paragraph 3-3.1 shall be tested as follows utilizing a Digital Equipment Corporation Memory Plane Tester, Model 1516, or equivalent.

4-2.1.1 X and Y current pulses are to be adjusted for equal amplitude within ± 1%. Pulse width shall be 3 µsec ± 0.1 µsec measured at 0.5 amplitude. Rise and fall times are 0.5 µsec ± 0.05 µsec measured between the 10% and 90% points of the pulse amplitude. Pulse Repetition Frequency shall be 80KC.

4-2.1.2 At each of the temperatures specified in paragraph 3-3.1.1, X, Y, and Z currents shall be adjusted as follows; 0°C, 323 ma; 25°C, 300 ma; 70°C, 260 ma.

4-2.1.3 The "worst word" (double checkerboard) pattern and its complement shall be cycled throughout the Erasable Memory. Outputs are to be examined one digit plane at a time for the following: Minimum one (V_1), Maximum Zero (V_0), switching time (T_s) and peaking time (T_p).

4-2.1.4 X, and Z current amplitudes shall all be equal. During test Z currents shall be varied ± 8% from nominal value without any deterioration of observed characteristics.

4-2.2 Environmental Characteristics. The following environmental tests shall be conducted with the Erasable Memory non-operative, except as specified under paragraph 4-2.2.1 Vibration. The procuring activity shall provide a suitable jig for supporting and/or confining the Erasable Memory for Vibration and Shock tests unless otherwise specified in the contract or purchase order. All tests specified shall be made prior to Functional Tests required in paragraph 4-2.1.

4-2.2.1 Vibration. A continuity check to show an open circuit for a duration equal to or greater than 100 nano seconds with all outputs connected in series shall be made while the Erasable Memory is subjected to 10g's (0 to peak), 5 to 2,000 to 5 cps at 1 minute/octave logarithmic sweep once along each of three orthogonal axes, 0.12 inch maximum displacement.

4-2.2.2 Shock. The Erasable Memory shall be subjected to 50 g, 11 ± 1 millisecond, half sine wave, two (2) shocks in both directions in each of three mutually perpendicular axes, a total of twelve (12) shocks.

4-2.2.3 Thermal Cycling. The Erasable Memory shall be subjected to five (5) cycles applied according to MIL-STD-202, Method 102A except that temperature limits shall be -55°C and $+105^{\circ}$C.

4-2.3 Visual and Mechanical Inspection. A comprehensive inspection shall be made of the Erasable Memory to determine the extent of compliance with the requirements of this specification and the applicable NASA drawings specified in section 2, and shall include determination of at least the following:

1. Dimensions, appearance, and markings
2. Compliance with specific ratings and conformance to applicable specifications.

INCHES
0 1 2

3. Finish, coatings, construction, markings, and nameplates, as applicable.

4. Wiring, soldering, and terminals, as applicable.

5. Workmanship and cleanup.

4-3 QUALIFICATION AND REQUALIFICATION TESTS. Qualification and requalification tests shall comply with the requirements for Acceptance Tests specified in paragraph 4-2 unless otherwise specified in the contract or purchase order.

5. PREPARATION FOR DELIVERY

5-1 PRESERVATION AND PACKAGING. The Erasable Memory preservation and packaging for delivery shall be per ND 1002215, Class I.

6. NOTES

6-1 ORDERING DATA. Procurement documents should specify the following:

(a) Title, number and date of this specification.

(b) Requirements for qualification of contractors to be awarded orders for Erasable Memories covered by this specification.

(c) Special instructions relative to the performance of required tests.

Notice: When APOLLO G&N drawings, specifications, or other data are used for any purpose other than in connection with a definitely related APOLLO G&N procurement operation, the National Aeronautics and Space Administration thereby incurs no responsibility nor any obligation whatsoever; and the fact that APOLLO G&N may have formulated, furnished, or in any way supplied the said drawings, specifications or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
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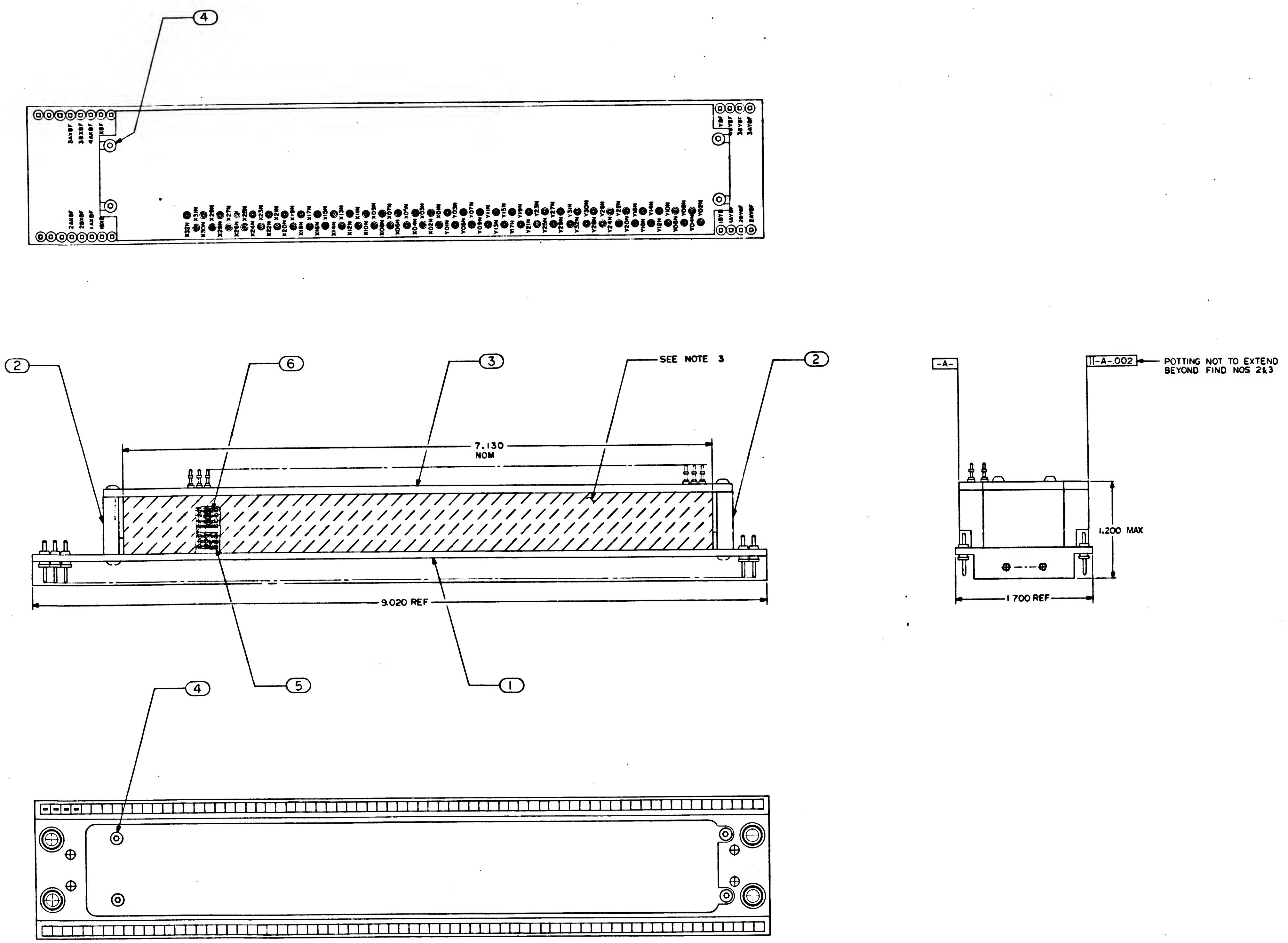
B	REVISED PER TDRR 00439	2/20/63	



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CLASS B RELEASE TDR No. 00309 DA

30 Jan 1963

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. CORE STACK TO BE WIRED PER DRAWING NOS. 1006050, 1006056. NO SPLICES SHALL BE ALLOWED IN THIS WIRING.
3. MATS TO BE FOLDED PER DRAWING NO. 1006051 AND ASSEMBLED TO FIND 1 SUCH THAT THE Y LINE TERMINATIONS ARE ADJACENT TO THE LINE OF PINS Y05D ___ Y08D
4. STACK WIRING TERMINATIONS TO BE SOLDERED PER MSFC PROC.-158-A TO PINS AS DESIGNATED BY SILK SCREENING ON FIND 1 AND FIND 3.
5. ASSEMBLY TO BE VACUUM ENCAPSULATED USING POTTING COMPOUND PER
6. ENCAPSULATED ASSEMBLY TO BE VOID FREE AS DETERMINED BY WEIGHING, RADIOGRAPH, OR OTHER METHOD DEEMED SATISFACTORY BY M.I.T.
7. TEST PER

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
A R		WIRE, ELECTRICAL	6
16,384	1006786	FERRITE CORE	5
8	1006783-10	2-56 UNC BUTTON HD SOCKET SCREW	4
1	1003071	FEED THRU TERM PLATE SUB ASSY	3
2	1004086	END PLATE	2
1	1003066	HEADER ASSEMBLY MARKING	1

LIST OF MATERIALS

1003069	
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APPLICATION	

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FINAL FINISH —

M I T
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT
DRAWN DATE 12/10/62
CHECKED 12/3/62
APPROVAL 28 JAN 63
APPROVAL 29 Jan 63
NASA APPROVAL 30 Jan 63
MIT APPROVAL 30 Jan 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY
CORE STACK
ASSEMBLY

CODE IDENT NO
SIZE E
NASA DRAWING NO. 1003068
SCALE 2/1
WT
SHEET 1 OF 1

1003068 B

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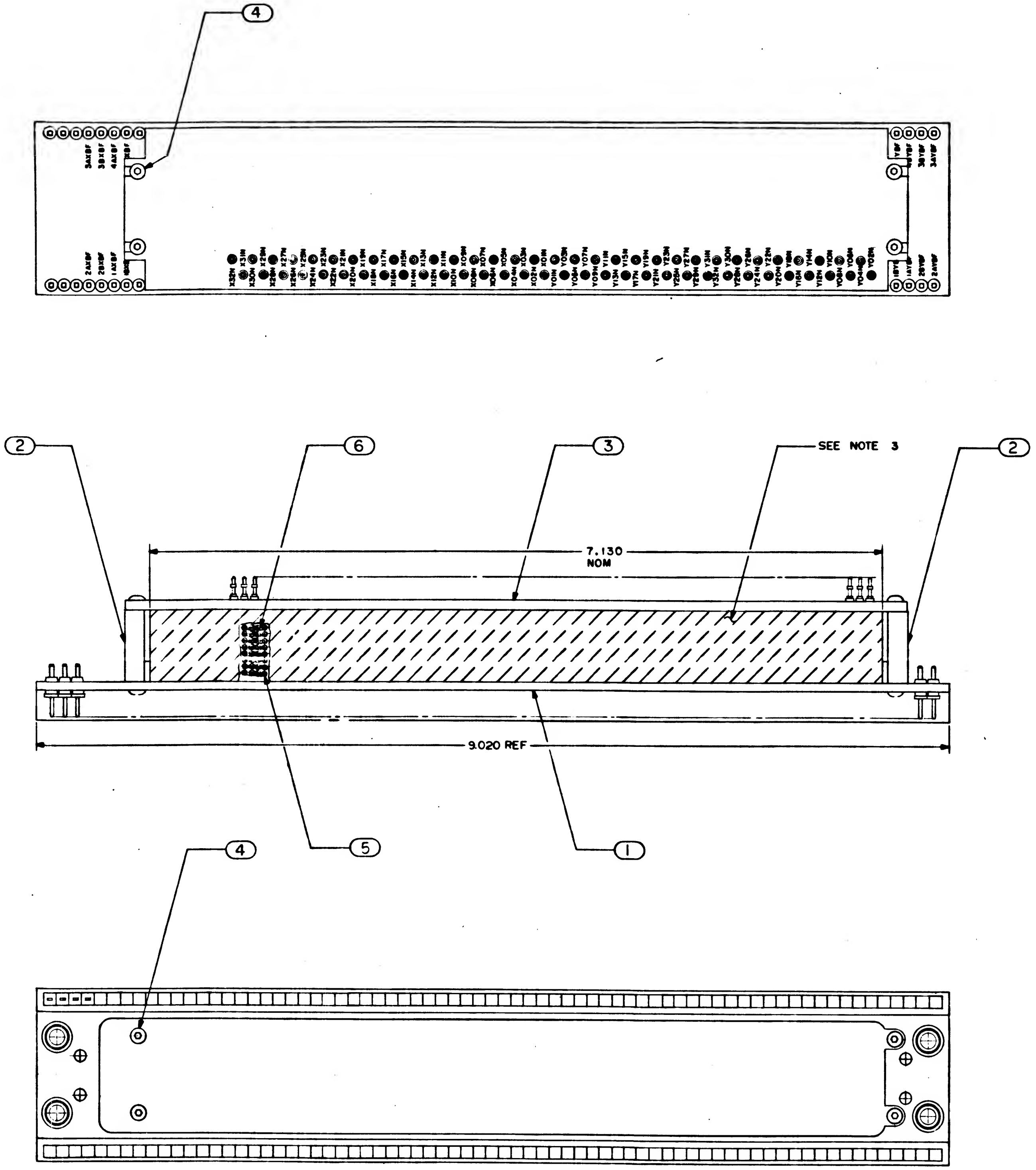
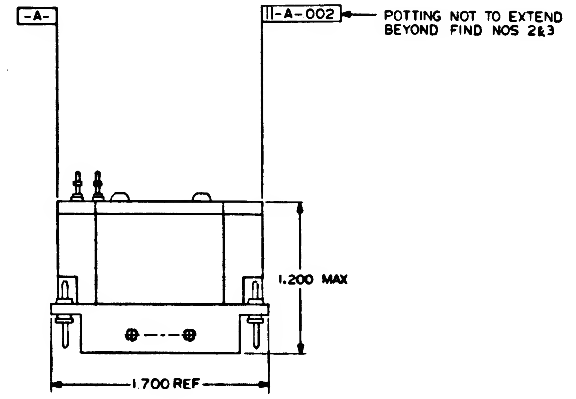
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00395	2-8-63	
B	REVISED PER TDRR 00439	2/20/63	WK
C	REVISED PER TDRR 00681	3-27-63	





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5. ASSEMBLY TO BE VACUUM ENCAPSULATED USING POTTING COMPOUND PER
6. ENCAPSULATED ASSEMBLY TO BE VOID FREE AS DETERMINED BY WEIGHING, RADIOGRAPH, OR OTHER METHOD DEEMED SATISFACTORY BY M.I.T.
7. TEST PER
8. COAT THREADS AND FIND NO2, PER MIL-P-6585 WITH WET ZINC CHROMATE PRIMER
9. AFTER SOLDERING, PINS IN FIND 1 TO BE CUT .150 ±.020 ABOVE PLATE

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
A R		WIRE, ELECTRICAL	6
16,384	1006786	FERRITE CORE	5
8	1006783-10	2-56 UNC BUTTON HD SOCKET SCREW	4
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NEXT ASSY	USED ON
1003069	

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DO NOT SCALE THIS DRAWING
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HEAT TREATMENT —
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MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG NO CONTRACT
DRAWN DATE 12/18/62
CHECKED 12/31/62
APPROVAL 21 Jan 63
APPROVAL
NASA APPROVAL 30-63
MIT APPROVAL 30 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY CORE STACK ASSEMBLY

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003068
SCALE 2/1
WT
SHEET 1 OF 1

1003068 C

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REVISIONS TDRR 00309

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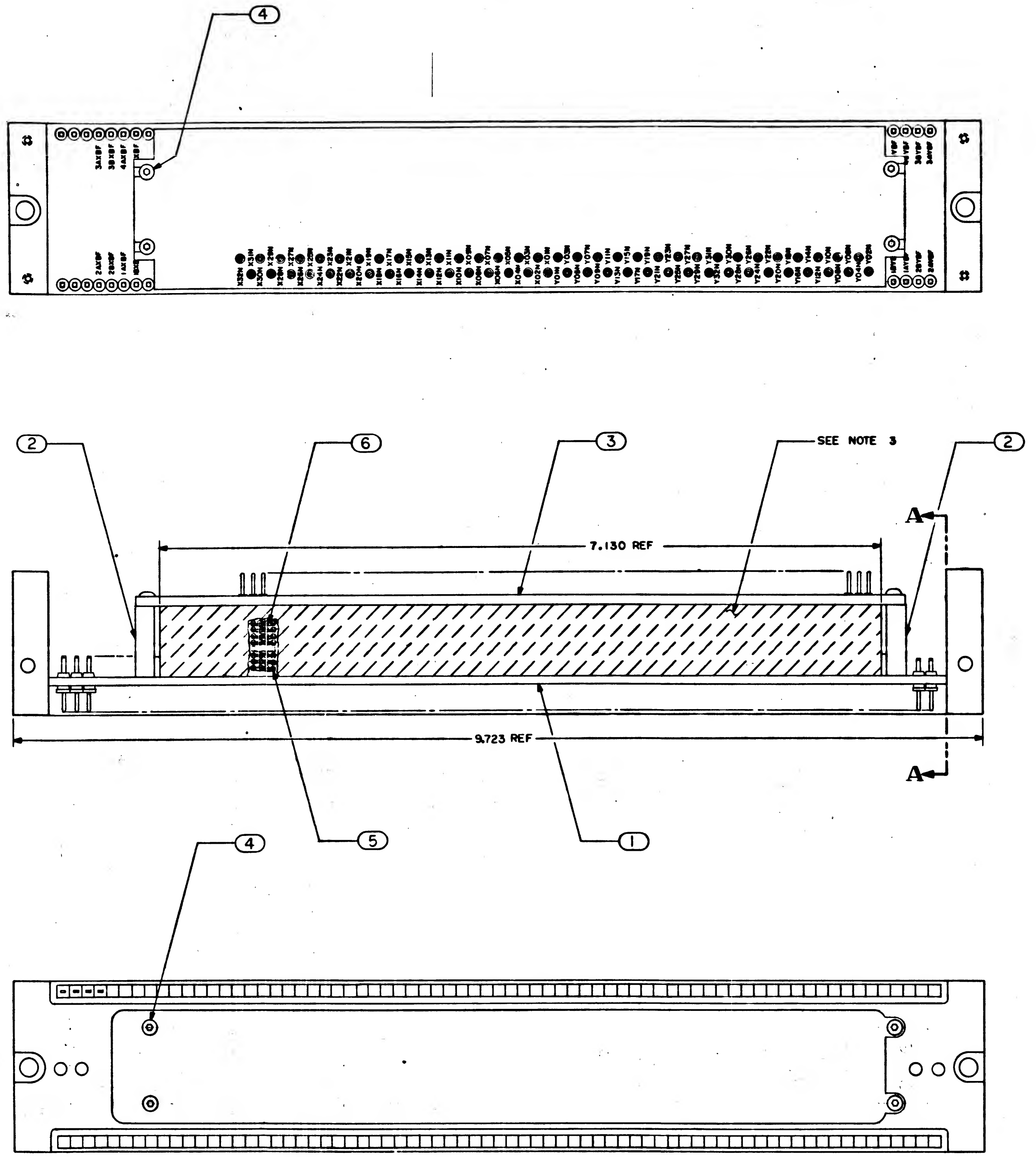
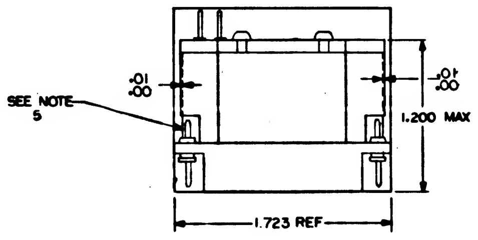
A	REVISED PER TDRR 00395	2-8-63	WK
B	REVISED PER TDRR 00439	2/28/63	WK
C	REVISED PER TDRR 00681	3-27-63	WK
D	REVISED AND UPGRADED FCR CLASS A RELEASE TDRR 01027		





SECTION A-A

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. CORE STACK TO BE WIRED PER DRAWING NOS. 1006050, 1006056. NO SPLICES SHALL BE ALLOWED IN THIS WIRING.
3. MATS TO BE FOLDED PER DRAWING NO. 1006051 AND ASSEMBLED TO FIND 1 SUCH THAT THE Y LINE TERMINATIONS ARE ADJACENT TO THE LINE OF PINS Y05D___Y08D
4. STACK WIRING TERMINATIONS TO BE SOLDERED PER MIL-S-6872 USING SOLDER PER QQ-S-571, Sn60 DESIGNATED BY SILK SCREENING ON FIND 1 AND FIND 3.
5. ASSEMBLY TO BE VACUUM ENCAPSULATED PER ND 1002200
7. TEST PER NDPS 1003068
8. COAT THREADS AND FIND NO2, PER MIL-P-6585 WITH WET ZINC CHROMATE PRIMER
9. AFTER SOLDERING, PINS IN FIND 1 TO BE CUT .125 ±.020 ABOVE INSULATOR
10. ASSEMBLE PER ND________

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
A.R	1006711-5	WIRE, ELECTRICAL	6
6384	1006786	FERRITE CORE	5
8	1006783-10	2-56 UNC BUTTON HD SOCKET SCREW	4
1	1003071	FEED THRU TERM PLATE SUB ASSY	3
2	1004086	END PLATE	2
1	1003066	HEADER ASSEMBLY MARKING	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003069	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

M I T
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO. CONTRACT
DRAWN DATE 12/19/62
CHECKED 12/31/62
APPROVAL 28 Jan 63
APPROVAL
NASA APPROVAL
MIT APPROVAL 30 Jan 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY
CORE STACK
ASSEMBLY

CODE IDENT NO. SIZE E NASA DRAWING NO. 1003068
SCALE 2/1 WT SHEET 1 OF 1

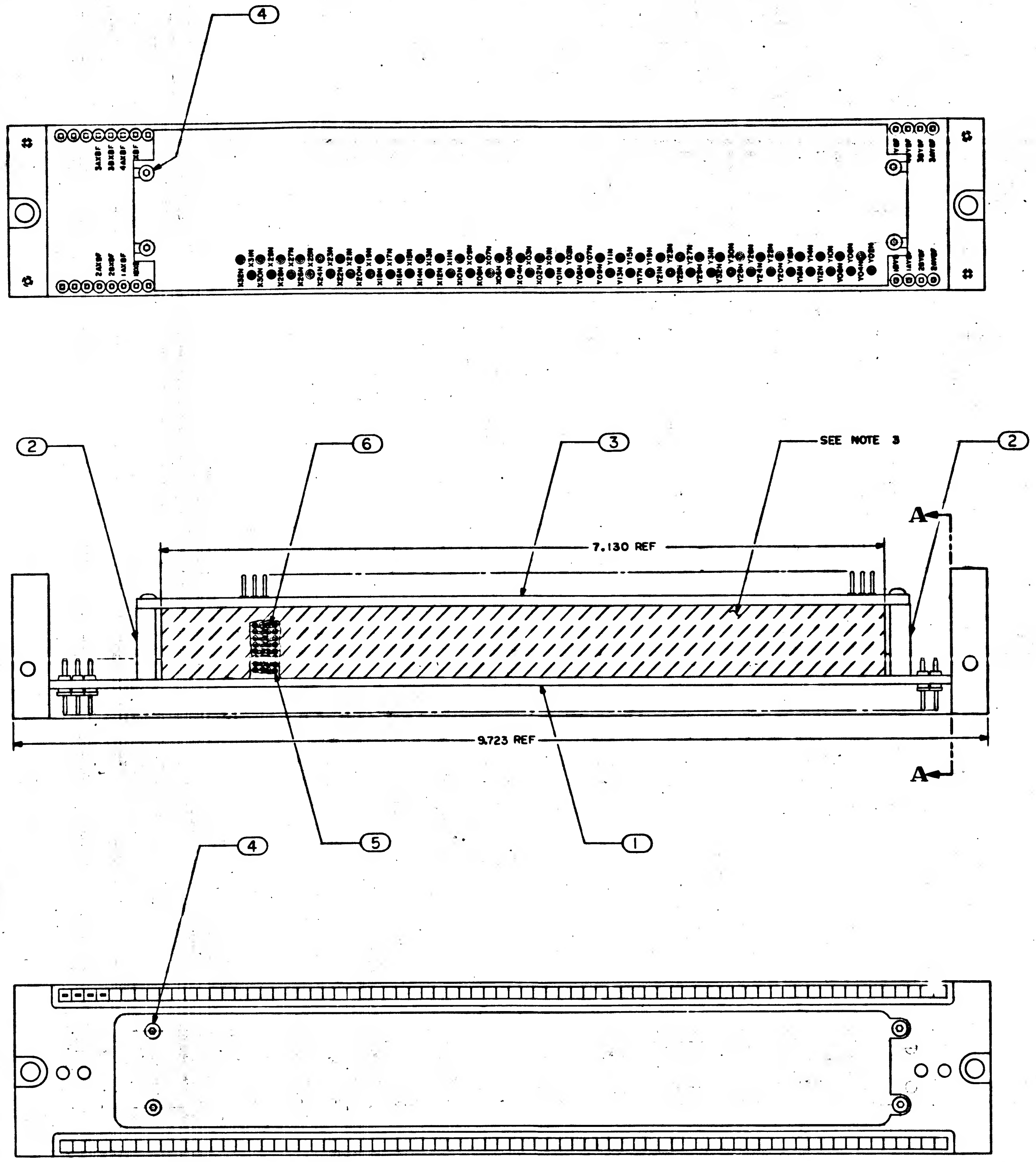
1003068 D

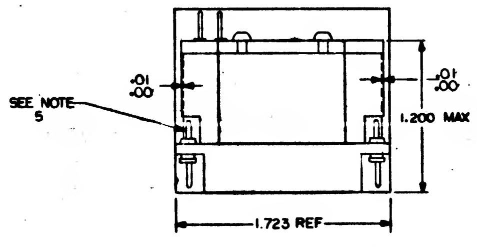
INCHES
PHOTOGRAPHIC SCALE ONLY

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS TDRR 00309

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00395	2-8-63	WK
B	REVISED PER TDRR 00439	2/20/63	WK
C	REVISED PER TDRR 00601	3-27-63	WK
D	REVISED AND UPGRADED FOR CLASS A RELEASE TDRR 01827	7/8/63	
E	REVISED PER TDRR 02278	7/24/63	





SECTION A-A

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. CORE STACK TO BE WIRED PER DRAWING NOS. 1006050, 1006056. NO SPLICES SHALL BE ALLOWED IN THIS WIRING.
3. MATS TO BE FOLDED PER DRAWING NO. 1006051 AND ASSEMBLED TO FIND 1 SUCH THAT THE Y LINE TERMINATIONS ARE ADJACENT TO THE LINE OF PINS Y05D ___ Y08D
4. STACK WIRING TERMINATIONS TO BE SOLDERED PER MIL-S-6872 USING SOLDER PER QQ-S-571, Sn60 DESIGNATED BY SILK SCREENING ON FIND 1 AND FIND 3.
5. ASSEMBLY TO BE VACUUM ENCAPSULATED PER ND 1002200

7. TEST PER NDPS 1003058
8. COAT THREADS AND FIND NO2. PER MIL-P-8585 WITH WET ZINC CHROMATE PRIMER
9. AFTER SOLDERING, PINS IN FIND 1 TO BE CUT .125 ±.020 ABOVE INSULATOR
10. ASSEMBLE PER ND

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
A.R.	1006711-20	WIRE, ELECTRICAL	6
8,384	1006786	FERRITE CORE	5
8	1006783-10	2-56 UNC BUTTON HD SOCKET SCREW	4
1	1003071	FEED THRU TERM PLATE SUB ASSY	3
2	1004086	END PLATE	2
1	1003066	HEADER ASSEMBLY MARKING	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003069	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

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DWG. NO. CONTRACT
DRAWN DATE 12/18/62
CHECKED 12/3/62
APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY CORE STACK ASSEMBLY

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003068
SCALE 2/1
WT
SHEET 1 OF 1

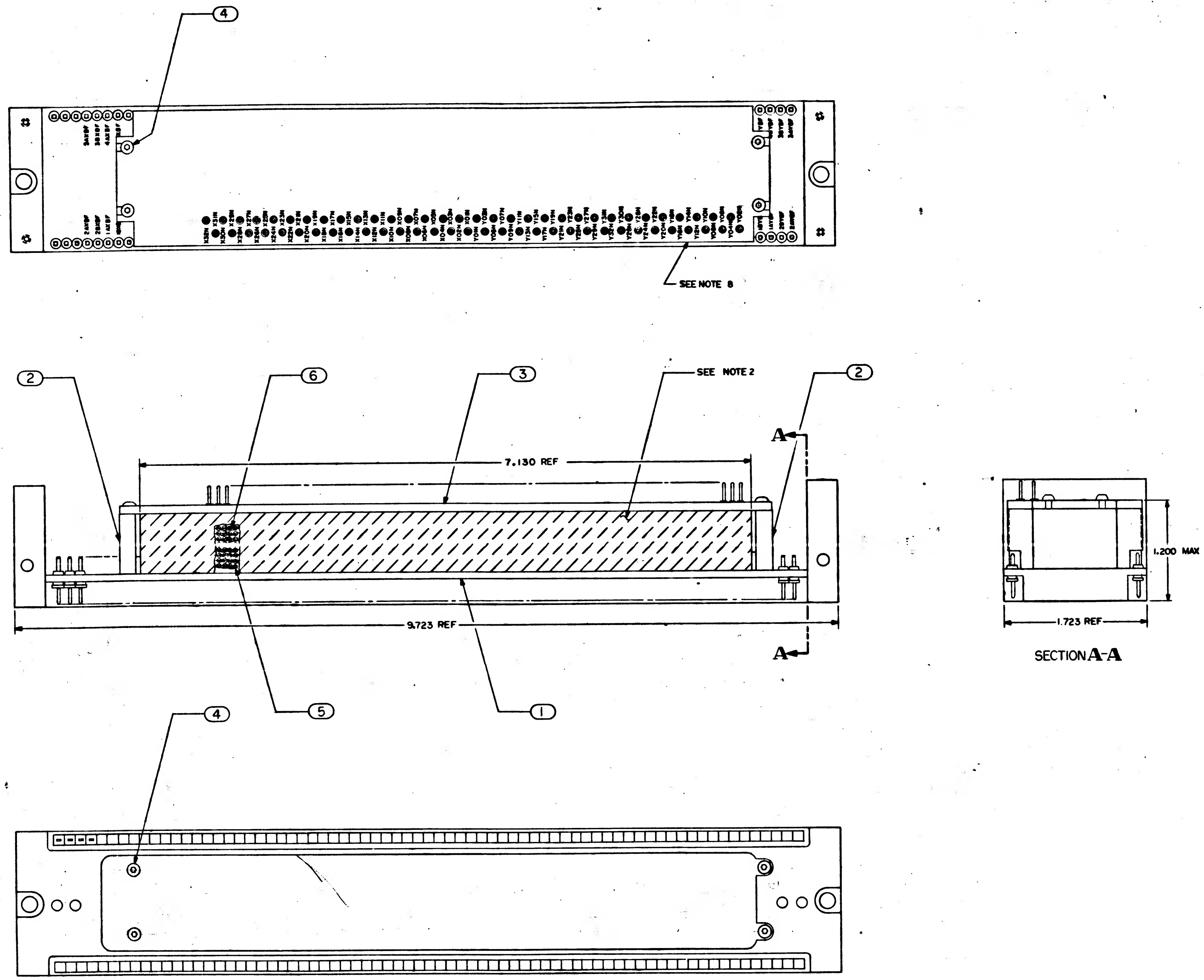
1003068 E

INCHES
PHOTOGRAPHIC SCALE ONLY

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

REVISIONS TDRR 01309

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00395	2-5-63	WK
B	REVISED PER TDRR 00439	2/20/63	WK
C	REVISED PER TDRR 00601	3-27-63	WK
D	REVISED AND UPGRADED FOR CLASS A RELEASE TDRR 01827	7/8/63 7/1/63	
E	REVISED PER TDRR 02278	7/24/63	WBT
F	REVISED PER TDRR 02858	8-6-63	



NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. MATS TO BE FOLDED PER DRAWING NO. 1006051 AND ASSEMBLED TO FIND 1 SUCH THAT THE Y LINE TERMINATIONS ARE ADJACENT TO THE LINE OF PINS Y05D ___ Y08D
3. STACK WIRING TERMINATIONS TO BE SOLDERED AS DESIGNATED BY MARKING ON FIND 1 AND FIND 3
4. ASSEMBLY TO BE VACUUM ENCAPSULATED PER ND1002200
5. ASSEMBLE AND TEST PER PS 1003068
6. COAT THREADS AND FIND NO. , PER MIL-P-8585 WITH WET ZINC CHROMATE PRIMER
7. AFTER SOLDERING, PINS IN FIND 1 TO BE CUT .125 ±.020 ABOVE INSULATOR
8. POTTING SHALL NOT EXTEND BEYOND SURFACE INDICATED AND NO WIRES OR CORES SHALL BE EXPOSED

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
A.R	1006711-20	WIRE, ELECTRICAL	6
16,384	1006788	FERRITE CORE	5
8	1000093-2	SCREW BUTTON HD S-LOC	4
1	1003071	FEED THRU TERM PLATE SUB ASSY	3
2	1004086	END PLATE	2
1	1003066	HEADER ASSEMBLY MARK'NG	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003069	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

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DWG NO. CONTRACT
DRAWN DATE 2/10/63
CHECKED 12/31/62
APPROVAL 28 Jan 63
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY
CORE STACK
ASSEMBLY

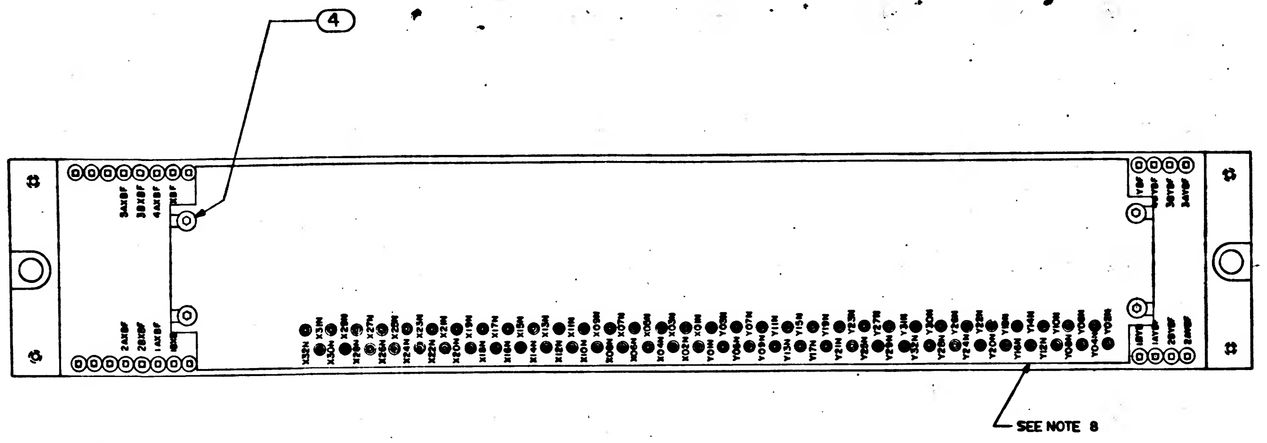
CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003068
SCALE 2/1
WT
SHEET 1 OF 1

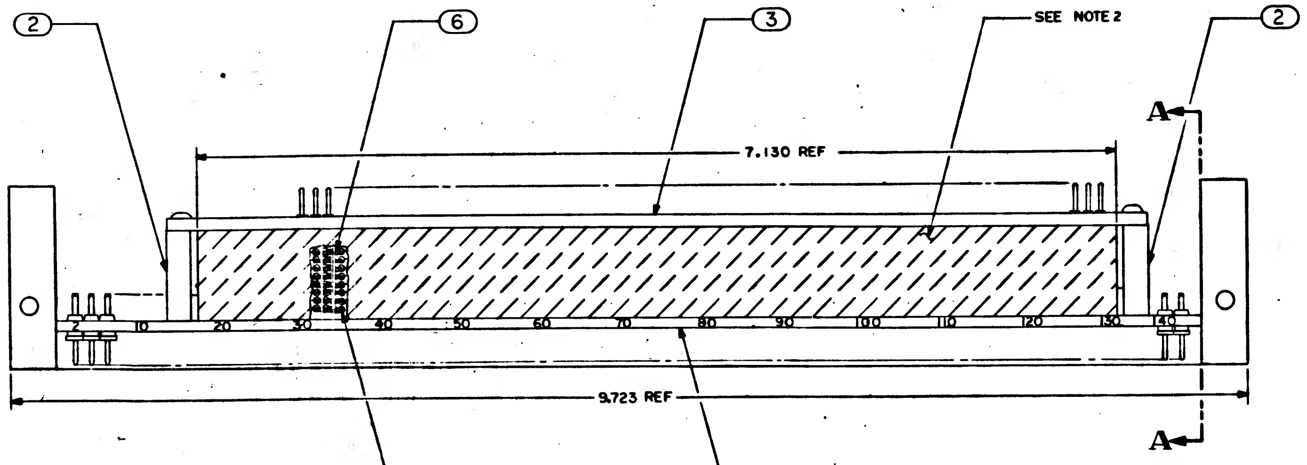
1003068 F

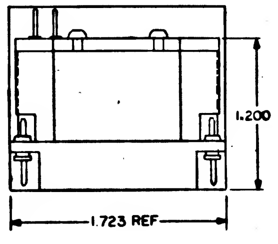
INCHES
PHOTOGRAPHIC SCALE ONLY

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00395	2-5-63	WK
B	REVISED PER TDRR 00439	2/20/63	WK
C	REVISED PER TDRR 00681	3-27-63	WK
D	REVISED AND UPGRADED FOR CLASS A RELEASE TDRR 01827	7/8/63 7/8/63	
E	REVISED PER TDRR 02278	7/24/63	
F	REVISED PER TDRR 02852	9-26-63	
G	REVISED PER TDRR 04164	10-24-63	WK

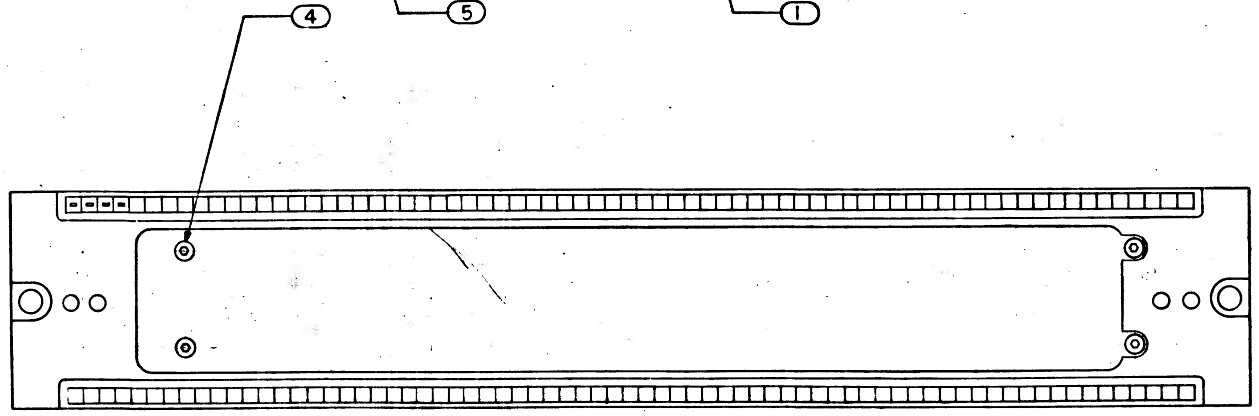
REVISIONS TDRR 04909







SECTION A-A



NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. MATS TO BE FOLDED PER DRAWING NO.1006051 AND ASSEMBLED TO FIND 1 SUCH THAT THE Y LINE TERMINATIONS ARE ADJACENT TO THE LINE OF PINS Y05D___Y08D
3. STACK WIRING TERMINATIONS TO BE SOLDERED AS DESIGNATED BY MARKING ON FIND 1 AND FIND 3
4. ASSEMBLY TO BE VACUUM ENCAPSULATED PER ND1002200
5. ASSEMBLE AND TEST PER PS 1003068
6. COAT THREADS AND FIND NO , PER MIL-P-8585 WITH WET ZINC CHROMATE PRIMER
7. AFTER SOLDERING, PINS IN FIND 1 TO BE CUT .125 ±.020 ABOVE INSULATOR
8. POTTING SHALL NOT EXTEND BEYOND SURFACE INDICATED AND NO WIRES OR CORES SHALL BE EXPOSED

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
A.R	1006711-20	WIRE, ELECTRICAL	6
16,384	1006786	FERRITE CORE	5
8	1000093-2	SCREW BUTTON HD S-LOC	4
1	1003071	FEED THRU TERM PLATE SUB ASSY	3
2	1004086	END PLATE	2
1	1003077	HEADER ASSEMBLY MODULE	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003069	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± —
DECIMALS ±.005
ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

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CONTRACT
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CHECKED 12/31/62
APPROVAL 2 Jan 63
APPROVAL
NASA APPROVAL Jan 3
MIT APPROVAL 3 Jan 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY
CORE STACK
ASSEMBLY

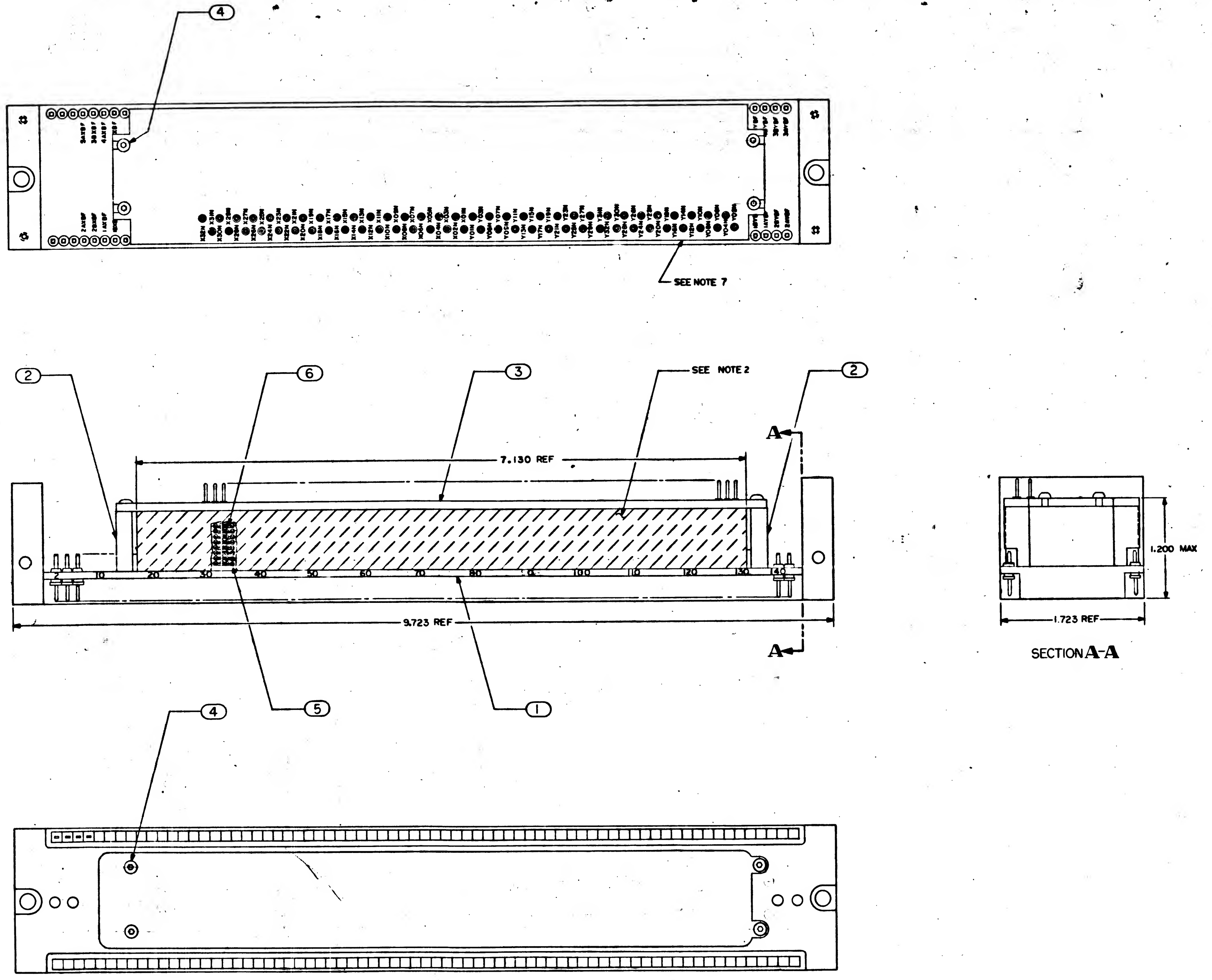
CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003068
SCALE 2/1
WT
SHEET 1 OF 1

1003068 G

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS TDRR 00309

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00395	2-8-63	WK
B	REVISED PER TDRR 00439	2/20/63	WK
C	REVISED PER TDRR 00681	3-27-63	WK
D	REVISED AND UPGRADED FOR CLASS A RELEASE TDRR 01827	6/12/63 7/2/63	
E	REVISED PER TDRR 02278	7/26/63	WBT
F	REVISED PER TDRR 02852	9-16-63	
G	REVISED PER TDRR 04164	11-21-63	WL
H	REVISED PER TDRR 04611	12-16-63	WC



NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. MATS TO BE FOLDED PER DRAWING NO.1006051 AND ASSEMBLED TO FIND 1 SUCH THAT THE Y LINE TERMINATIONS ARE ADJACENT TO THE LINE OF PINS Y05D___Y08D
3. STACK WIRING TERMINATIONS TO BE SOLDERED AS DESIGNATED BY MARKING ON FIND 1 AND FIND 3
5. ASSEMBLE AND TEST PER PS 1003068
6. ~~COAT THREADS AND FIND NO~~ , PER MIL-P-8585 WITH WET ZINC CHROMATE PRIMER
7. AFTER SOLDERING, PINS IN FIND 1 TO BE CUT .125 ±.020 ABOVE INSULATOR
8. POTTING SHALL NOT EXTEND BEYOND SURFACE INDICATED AND NO WIRES OR CORES SHALL BE EXPOSED

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
A.R	1006711-20	WIRE, ELECTRICAL	6
6,384	1006786	FERRITE CORE	5
8	1000093-2	SCREW BUTTON HD S-LOC	4
1	1003071	FEED THRU TERM PLATE SUB ASSY	3
2	1004086	END PLATE	2
1	1003077	HEADER ASSEMBLY MODULE	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003069	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± —
DECIMALS ±.005
ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

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CONTRACT
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CHECKED 12/31/62
APPROVAL WB Francis 25 Jan 63
APPROVAL
NASA APPROVAL 30-63
MIT APPROVAL 3-63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY CORE STACK ASSEMBLY

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003068
SCALE 2/1
WT
SHEET 1 OF 1

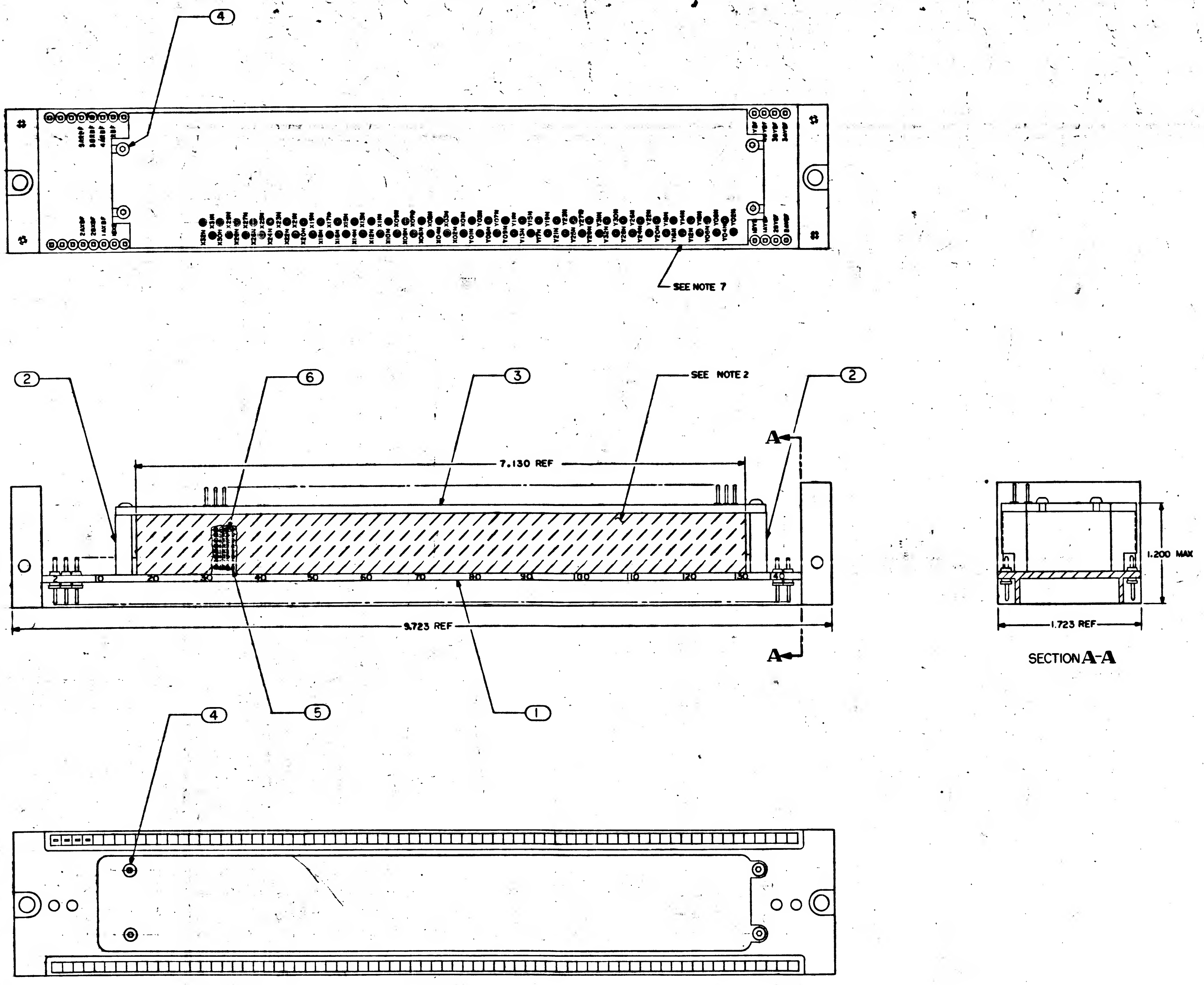
1003068 H

INCHES
PHOTOGRAPHIC SCALE ONLY

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

REVISIONS TDRR 00309

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00395	2-8-63	
B	REVISED PER TDRR 00439	2/20/63	
C	REVISED PER TDRR 00681		
D	REVISED AND UPGRADED FOR CLASS A RELEASE TDRR 01827		
E	REVISED PER TDRR 02278		
F	REVISED PER TDRR 02858		
G	REVISED PER TDRR 04168		
H	REVISED PER TDRR 04611		
J	REVISED PER TDRR 05630		



NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327

2. MATS TO BE FOLDED PER DRAWING NO.1006051 AND ASSEMBLED TO FIND 1 SUCH THAT THE Y LINE TERMINATIONS ARE ADJACENT TO THE LINE OF PINS Y05D___Y08D
3. STACK WIRING TERMINATIONS TO BE SOLDERED AS DESIGNATED BY MARKINGS ON FIND 1 AND FIND 3
4. AR DENOTES AS REQUIRED
5. ASSEMBLE AND TEST PER PS 1003068

6. COAT THREADS AND FIND NO , PER MIL-P-8585 WITH WET ZINC CHROMATE PRIMER
7. AFTER SOLDERING, PINS IN FIND 1 TO BE CUT .125 ±.020 ABOVE INSULATOR POTTING SHALL NOT EXTEND BEYOND SURFACE INDICATED AND NO
8. WIRES OR CORES SHALL BE EXPOSED
9. MARK PART NO. AND REVISION LETTER PER ND1002019

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
A.R	1006711-20	WIRE, ELECTRICAL	6
16,384	1006786	FERRITE CORE	5
8	1000093-2	SCREW BUTTON HD S-LOC	4
1	1003071	FEED THRU TERM PLATE SUB ASSY	3
2	1004086	END PLATE	2
1	1003077	HEADER ASSEMBLY MODULE	1

LIST OF MATERIALS

1003069	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

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INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT

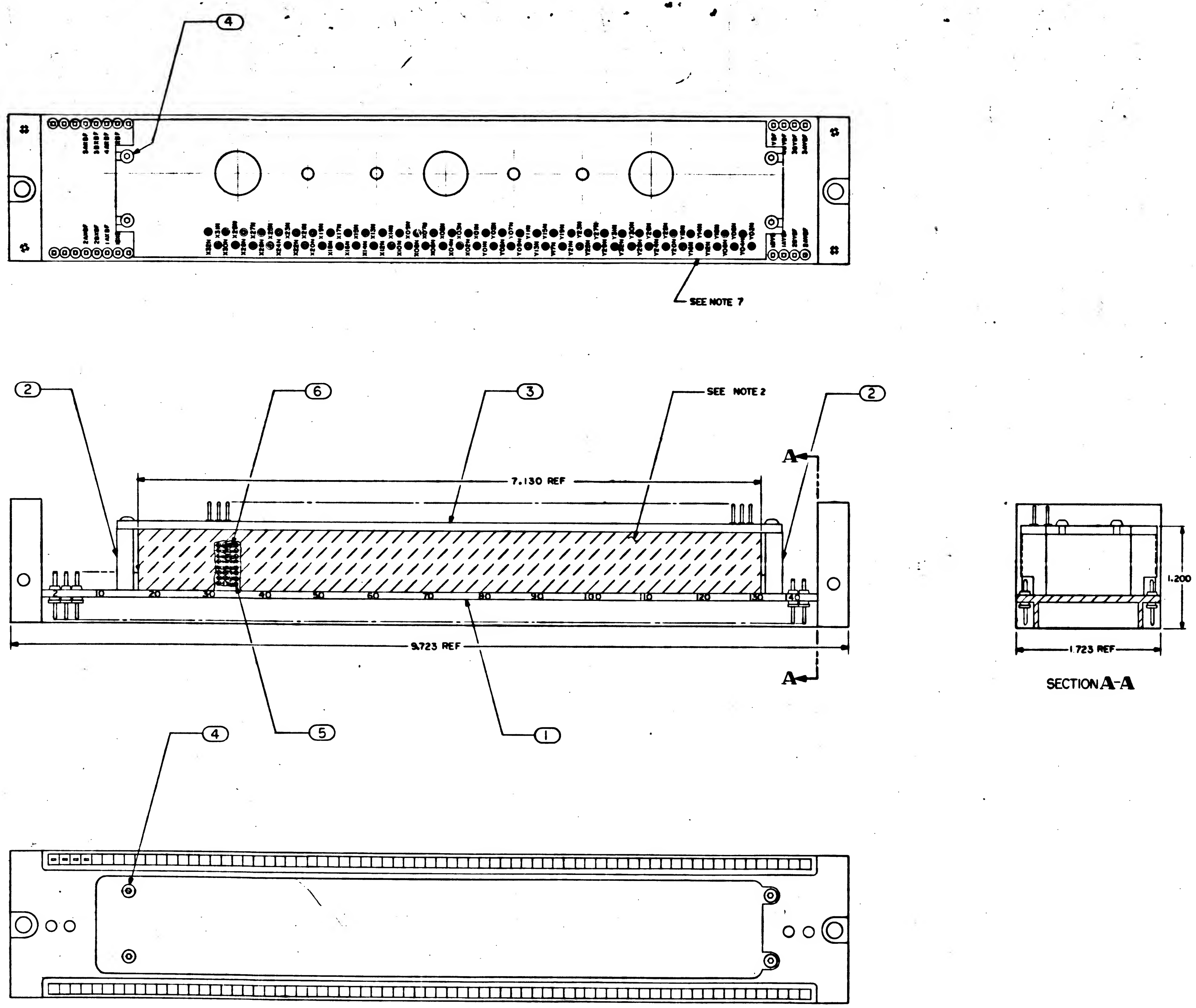
DRAWN DATE 12/18/62
CHECKED 12/31/62
APPROVAL 2 Jan 63
APPROVAL
NASA APPROVAL 1-30-63
MIT APPROVAL 3/1/63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY
CORE STACK
ASSEMBLY

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003068
SCALE 2/1
WT
SHEET 1 OF 1

REVISIONS TDRR 00909			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00395	2-8-63	WK
B	REVISED PER TDRR 00439	2/20/63	WK
C	REVISED PER TDRR 00681	3-27-63	WK
D	REVISED AND UPGRADED FOR CLASS A RELEASE TDRR 00827	7/8/63	
E	REVISED PER TDRR 02278	7/26/63	WB
F	REVISED PER TDRR 02852	9-16-63	
G	REVISED PER TDRR 04164	10-21-63	WK
H	REVISED PER TDRR 04611	31 Mar 63	WK
J	REVISED PER TDRR 05630		
K	REVISED PER TDRR 11310 DR D.A.Clement CHK	9/4/64	HCC



SECTION A-A

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. MATS TO BE FOLDED PER DRAWING NO.1006051 AND ASSEMBLED TO FIND 1 SUCH THAT THE Y LINE TERMINATIONS ARE ADJACENT TO THE LINE OF PINS Y05D___Y08D
3. STACK WIRING TERMINATIONS TO BE SOLDERED AS DESIGNATED BY MARKINGS ON FIND 1 AND FIND 3
4. AR DENOTES AS REQUIRED
5. ASSEMBLE AND TEST PER PS 1003068
6. COAT THREADS AND FIND NO , PER MIL-P-8585 WITH WET ZINC CHROMATE PRIMER
7. AFTER SOLDERING, PINS IN FIND 1 TO BE CUT .125 ±.020 ABOVE INSULATOR POTTING SHALL NOT EXTEND BEYOND SURFACE INDICATED AND NO
8. WIRES OR CORES SHALL BE EXPOSED
9. MARK PART NO. AND REVISION LETTER PER ND1002019

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
A.R	1006711-20	WIRE, ELECTRICAL	6
16,384	1006786	FERRITE CORE	5
8	1000093-2	SCREW BUTTON HD S-LOC	4
1	1003071	FEED THRU TERM PLATE SUB ASSY	3
2	1004086	END PLATE	2
1	1003077	HEADER ASSEMBLY MODULE	1

LIST OF MATERIALS

1003069	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

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DWG. NO.
CONTRACT
DRAWN DATE 12/18/62
CHECKED 12/3/62
APPROVAL 28 Jan 63
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY CORE STACK ASSEMBLY

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003068
SCALE 2/1
WT
SHEET 1 OF 1

1003068 K

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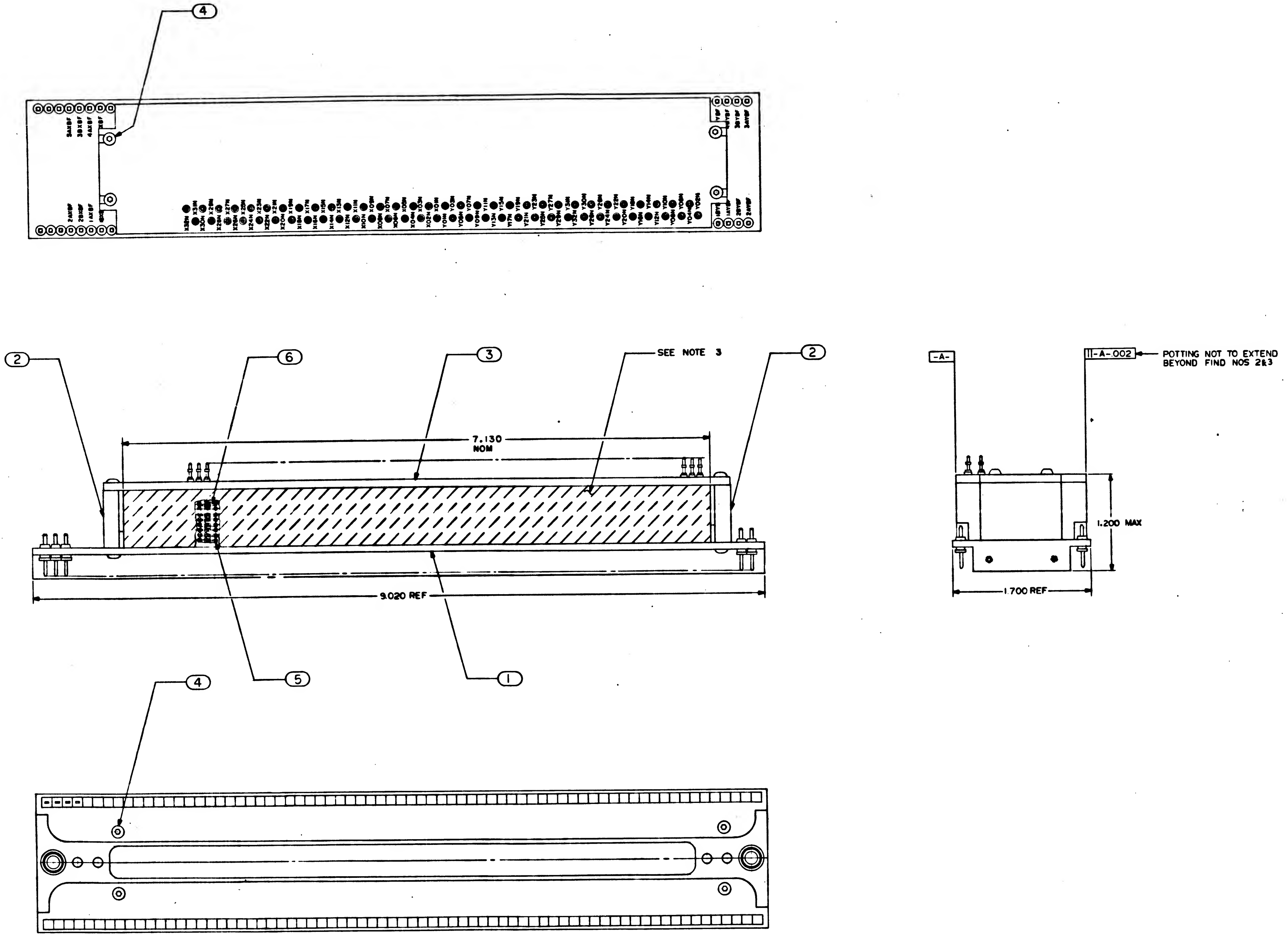
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00309 DATE 30 Jan 1963

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ASSEMBLE PER
3. ENCAPSULATE PER
4. TEST PER

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
A.R		WIRE, ELECTRICAL	6
16,384	1006786	FERRITE CORE	5
8	1006783-10	2-56 UNC BUTTON HD SOCKET SCREW	4
1	1003071	FEED THRU TERM PLATE SUB ASSY	3
2	1004086	END [illegible]TE	2
1	1003066	HEADER ASSEMBLY REWORK	

LIST OF MATERIALS

1003069	
NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
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MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT
DRAWN DATE 12/19/62
CHECKED 12/31/62
APPROVAL 21 Jan 63
APPROVAL 29 Jan 63
NASA APPROVAL 1-30-63
MIT APPROVAL 30 Jan 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY CORE STACK ASSEMBLY

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003068
SCALE 2/1 WT SHEET 1 OF 1

1003068

Apollo G&N Specification
PS- 1003068
Class A Release
TDRR 02891
23 August 1963

PROCUREMENT SPECIFICATION
FERRITE CORE ASSEMBLY
ERASABLE MEMORY

Record of Revisions

Revision Letter	TDRR No.	Pages Revised	Approvals		Date
			MIT	NASA	

This specification consists of page i to iv and 1 to 5 inclusive.

Apollo G&N Specification
PS -1003068
23 August 1963

FERRITE CORE ASSEMBLY,
ERASABLE MEMORY

The Ferrite core assembly is intended for use in the APOLLO Guidance and Navigation program.

MIT INSTRUMENTATION LABORATORY

8/30/63
NASA/MSC APPROVAL

APOLLO G&N Specification
PS 1003068
23 August 1963

PROCUREMENT SPECIFICATION
FOR
FERRITE CORE ASSEMBLY,
ERASABLE MEMORY

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SECTION	TITLE	PAGE
1	Scope	1
2	Applicable Documents	1
3	Storage Capacity	2
4	Ferrite Core	2
5	Wire	2
6	Mechanical Inspection	2
7	Potting	3
8	Thermal Test	3
9	Shock & Vibration Test	3
10	Electrical Test	3

Apollo G&N Specification
PS-1003068
23 August 1963

PROCUREMENT SPECIFICATION
FERRITE CORE ASSEMBLY,
ERASABLE MEMORY

1. SCOPE

1.1 This specification establishes the requirements for the procurement of a ferrite core assembly, hereinafter called Erasable Memory.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on the date of invitation for bids form a part of this specification to the extent specified herein.

SPECIFICATIONS

Military

MIL-P-116	Preservation, Methods of
MIL-E-17555	Electronic and Electrical Equipment and Associated Repair Parts, Preparation for Delivery of

Apollo G&N

ND-1015404 CLASS 2	General Specification Configuration Process and Quality Control Requirements for Suppliers of High Reliability Articles for Use in Spacecraft and Supporting Equipment

STANDARDS

Military

MIL-STD-202	Test Methods for Electrical and Electronic Component Parts
MIL-STD-810	Environmental Test Methods for Aerospace and Ground Equipment

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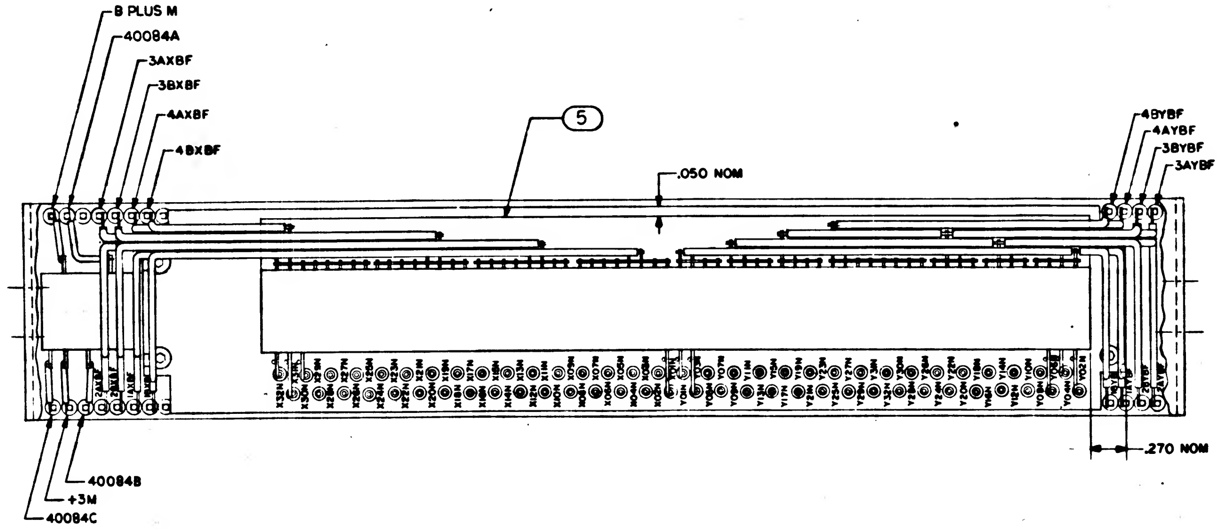
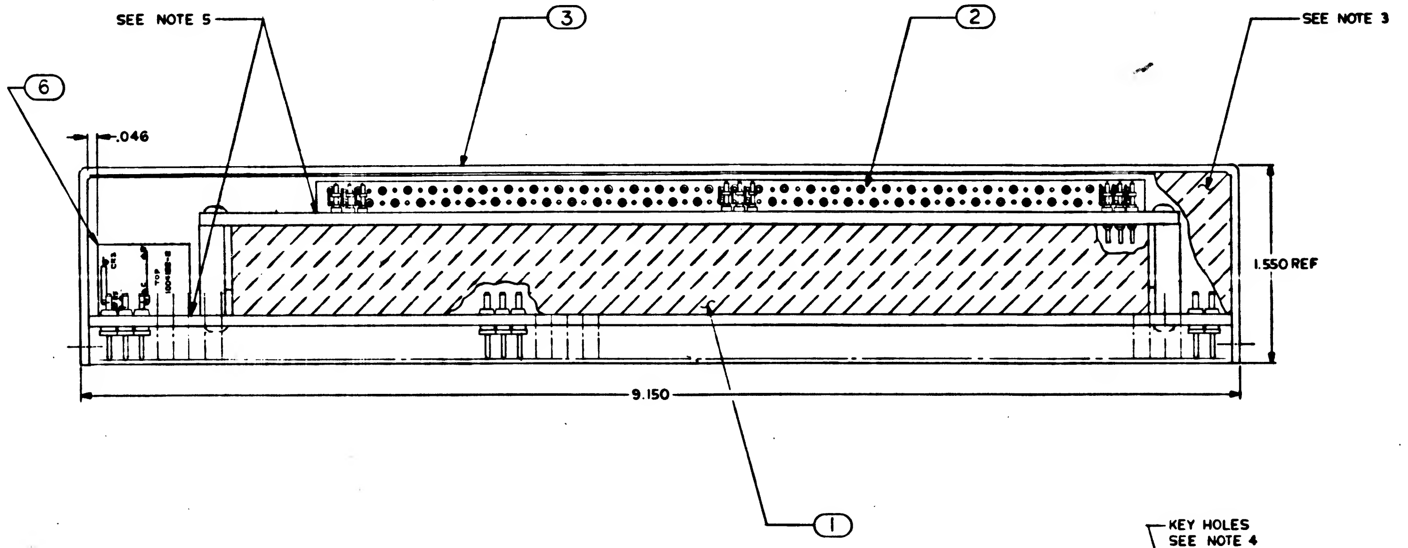
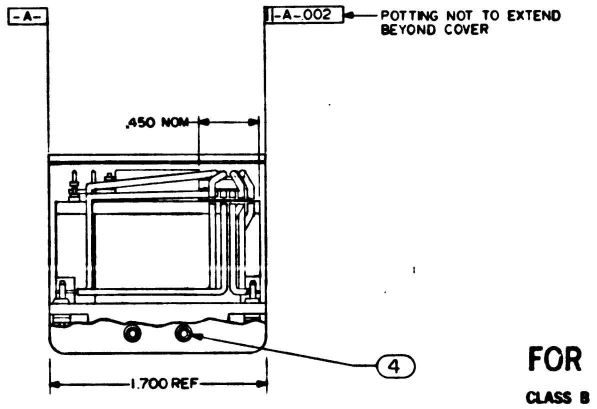
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	CHANGED PER TDRR 01170	5-1-63	RD







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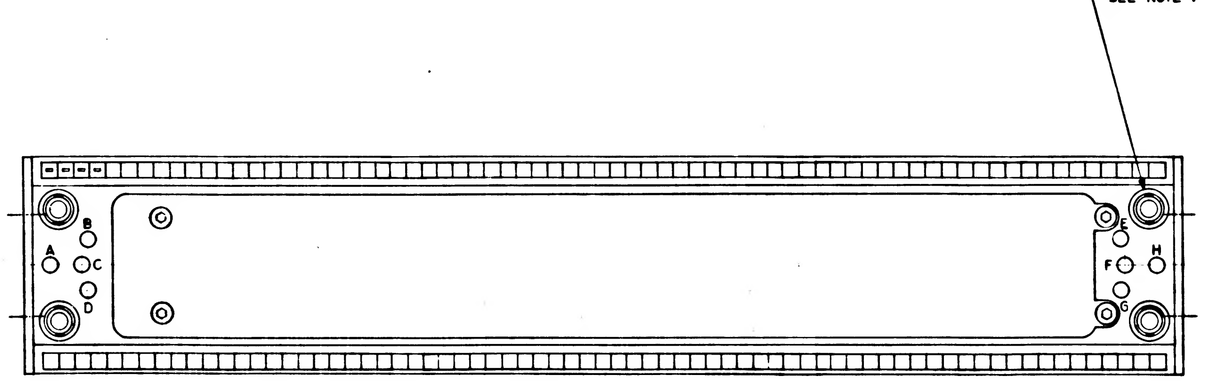
CLASS B RELEASE TDR No. 00436 DATE 8-20-63



NOTES:—

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005
3. ENCAPSULATE WITH POLYURETHANE FOAM PER ND 1002002 (BLACK)
4. PLUG KEY POSITIONS INDICATED IN CHART PER ND
5. CEMENT FIND NO. 2, FIND NO. 5, AND FIND NO. 6 TO FIND NO. 1 PER ND 1002004

A	B	C	D	E	F	G	H

KEY POSITIONS

SEE NOTE 4

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1003094	ERASABLE MEM, VOLT SOURCE SUB-ASSY	6
1	1004081-3	INSULATOR, MYLAR	5
4	1006783-9	2-56 UNC BUTTON HD SOCKET SCREW	4
1	1003058-1	COVER & INSULATOR ASSEMBLY	3
1	1003070	DIODE BLOCK ASSEMBLY	2
1	1003068	ERASABLE MEMORY CORE STACK, ASSY	1

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
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HEAT TREATMENT —
FINAL FINISH —

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DWG NO CONTRACT

DRAWN Bonanno DATE 12/13/62
CHECKED 12/17/62
APPROVAL 2/19/63
APPROVAL 2/18/63
NASA APPROVAL 2/20/63
MIT APPROVAL 2/20/63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY STICK ASSEMBLY

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003069
SCALE 2/1 WT — SHEET 1 OF 1

1003069

INCHES
PHOTOGRAPHIC SCALE ONLY

APOLLO G&N Specification
PS 1003069 Rev. A
Original Issue Date: 2/17/65
Release Authority: TDRR 16537
Class A Release

PROCUREMENT SPECIFICATION
FOR
ERASABLE MEMORY MODULE

Record of Revisions

	Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
					MIT	NASA
Ⓜ	4/22/65	A	18439	1, 5, & 6	904	

This specification consists of pages 1 to 8 inclusive.

APPROVALS	4/11/65 NASA/MSC	E C Hall 2/12/65	17 Feb 65 MIT/IL	2/3/65 2/5/65 Bill MacMunn 1/20/65 RAY 2-4-65

3-3.1 Functional Requirements. The module shall meet the following requirements under the conditions as specified below.

3-3.1.1 With the module connected for, and prior to operational electrical tests, verify that the module case is isolated from the return side of the power supply (0 VDC) by not less than 10 megohms. The operational electrical tests, sections 3-3.1.2 through 3-3.1.3, shall be conducted with the module case connected to the return side of the power supply (0 VDC).

3-3.1.2 Input Current Pulses. The X and Y lines input current pulses shall be driven in a current coincidence mode by pulses with the following characteristics. See Figure 1.

Amplitude (A)	295 ± 8 ma
Rise Time (TR)	0.30 ± 0.05 usec.
Fall Time (TF)	0.30 ± 0.15 usec.
Pulse Width (PW)	2.0 ± 0.2 usec.

3-3.1.2.1 The Z lines shall be driven by a current pulse with the following characteristics, see Figure 1.

Amplitude (A)	295 ± 8 ma
Rise Time (TR)	0.30 ± 0.05 usec.
Fall Time (TF)	0.30 ± 0.15 usec.
Pulse Width (PW)	3.5 ± 0.4 usec.

3-3.1.3 Output Bit Characteristics. The module shall be exercised by cycling throughout the memory, a simulated worst word in the form of a double checkerboard pattern and its complement. Each output bit shall be examined for the following characteristics, see Figure 2.

Minimum ONE (V_1)	42 mv
Maximum ZERO (V_0)	27 mv
Time to Peak (Tp)	0.40 to 0.64 usec.
Time to Switch-Off (Tsw)	0.96 to 1.36 usec.

3-3.2 Environmental Requirements. The module shall be operated with the case ungrounded in accordance with the requirements specified in sections 3-3.1.2 thru 3-3.1.3 when the ambient temperatures are 0° ± 2°C and 65° ± 2°C. Operation of the Erasable Memory Module under the temperature extremes specified herein is for verification of good workmanship. Only intermittent test results, shorts, or open circuits shall indicate a malfunction within the module.

3-3.3 Service Life. The module design is intended to meet the following requirements.

3-3.3.1 Operating Life. The module is intended to meet performance specifications for at least 2000 hours of operation, excluding the contractor's test time of the complete unit.

3-3.3.2 Shelf Life. The module is intended to have a shelf life of at least 3 years, without operation, at ambient room temperature after final acceptance at the contractor's plant when packaged in accordance with ND 1002214.

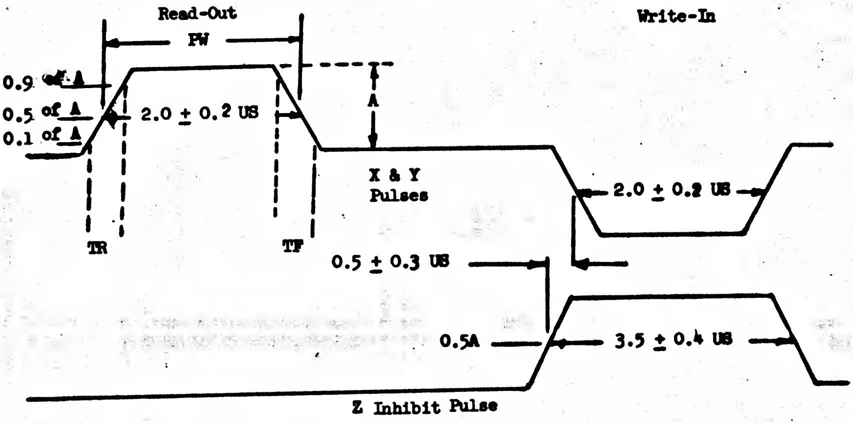

FIGURE 1. Input Waveform Characteristics.

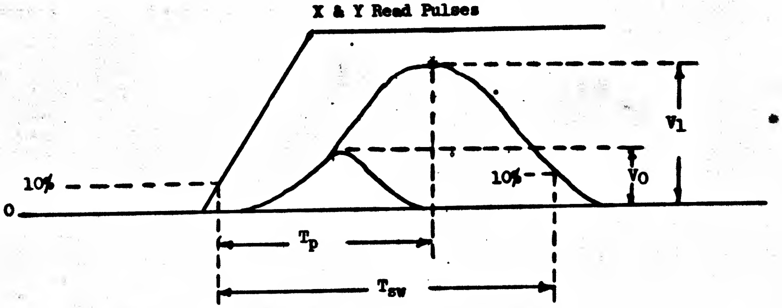

FIGURE 2. Output Waveform Characteristics.

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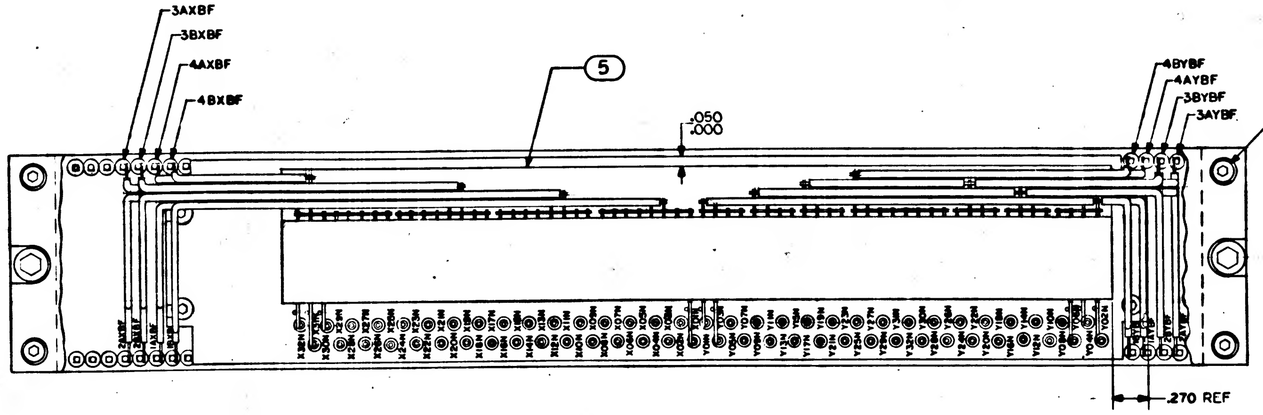
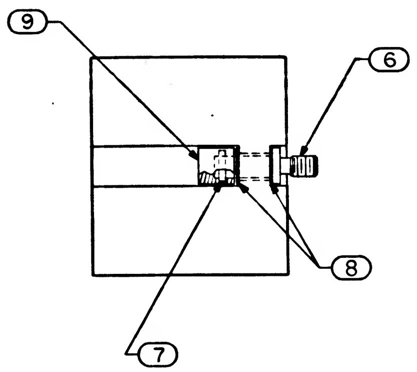
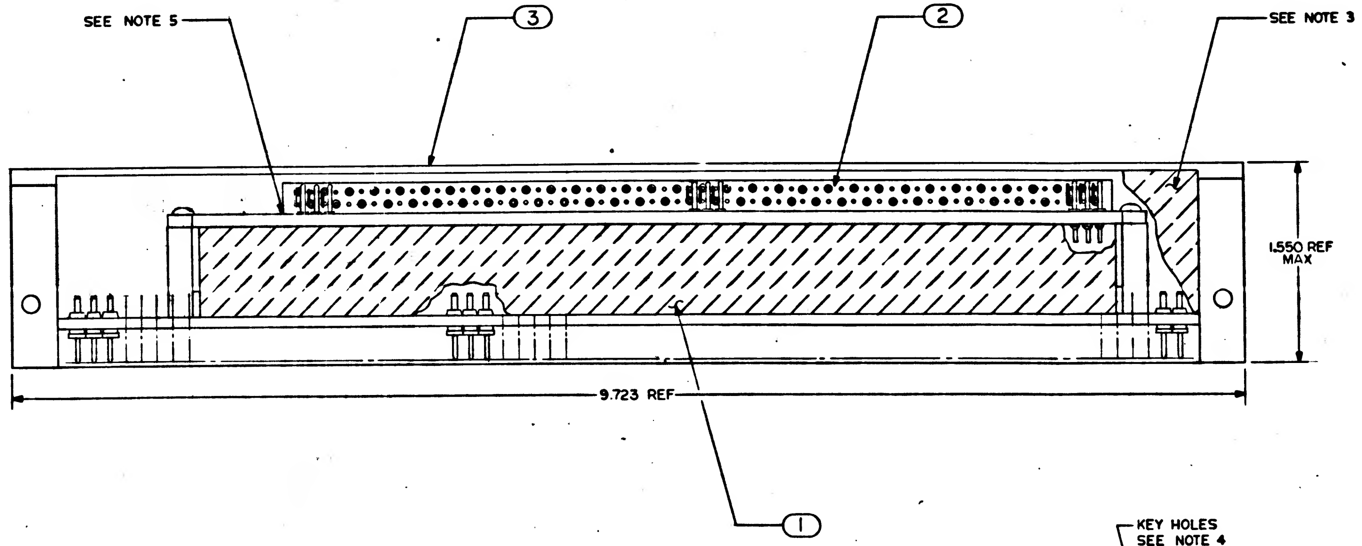
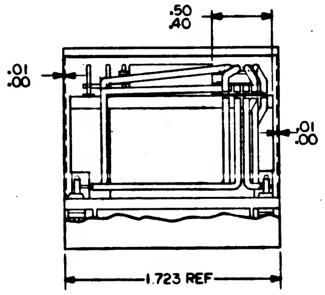
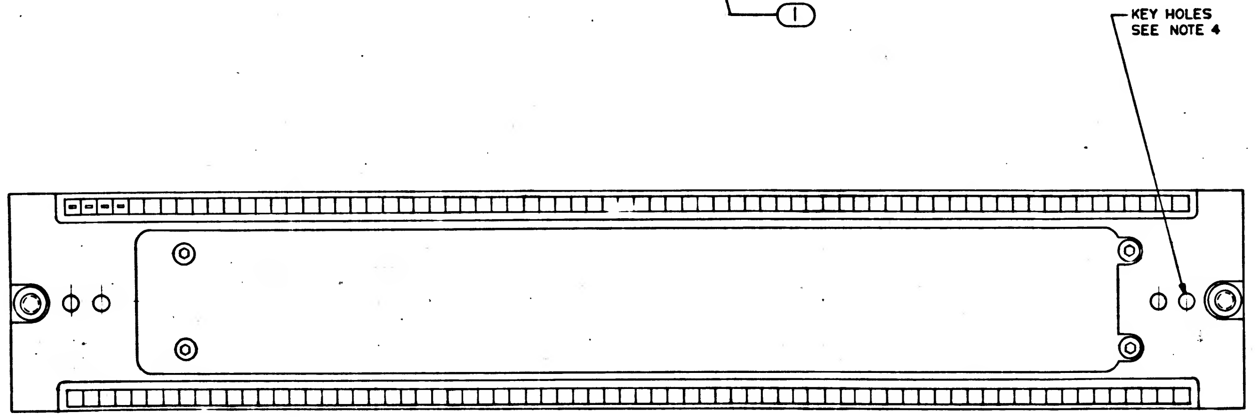
REVISIONS			
SYM	DESCRIPTION B-00436	DATE	APPROVAL
A	CHANGED PER TDRR 01170	5-8-63	
B	REVISED AND UPGRADED FOR CLASS A RELEASE 01822	7/2/63	











NOTES:—

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005
3. ENCAPSULATE WITH POLYURETHANE FOAM PER ND 1002002 (BLACK)
4. PLUG KEY POSITIONS INDICATED IN CHART PER ND
5. CEMENT FIND NO. 2 TO FIND NO. 1 PER ND 1002004
6. A R DENOTES AS REQUIRED

A	B	C	D
KEY POSITIONS			

SEE NOTE 4

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
2	1004207	DRIVE CYLINDER EJECTION SCREW	9
4	1004206	WASHER, THRUST	8
2	MS39086-100	PIN SPRING, SPIRAL	7
2	1004205	SCREW, EJECTION	6
A R	1006849-8	INSULATION TAPE ELECTRICAL	5
4	1006783-9	2-56 UNC BUTTON HD SOCKET SCREW	4
1	1004190	COVER, ERASABLE MEMORY MODULE	3
1	1003070	DIODE BLOCK ASSEMBLY	2
1	1003068	ERASABLE MEMORY CORE STACK, ASSY	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 ANGLES ± —
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DRAWN DATE 2/13/62
CHECKED 12/3/62
APPROVAL W.F. Turner 2/19/63
APPROVAL 2/19/63
NASA APPROVAL 2/20/63
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY STICK ASSEMBLY

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003069
SCALE 2/1
WT —
SHEET 1 OF 1

1003069 B

APOLLO G&N Specification
PS 1003069 Rev. B
Original Issue Date: 2/17/65
Release Authority: TDRR 16537
Class A Release

PROCUREMENT SPECIFICATION
FOR
ERASABLE MEMORY MODULE

Record of Revisions

	Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
					MIT	NASA
Ⓜ	4/28/65	A	18439	1, 5, & 6		
Ⓜ	9/1/65	B	22171	1, 5, & 6		

This specification consists of pages 1 to 8 inclusive.

APPROVALS	4/11/65 NASA/MSC	E C Hall 2/12/65 MIT/IL	2/3/65 2/5/65 1/20/65 RAY 2-4-65

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Minimum ONE (V_1)	42 mv
Maximum ZERO (V_0)	40 mv
Time to Peak (T_p)	0.40 to 0.70 usec.
Time to Switch-Off (Tsw)	0.85 to 1.36 usec.
Maximum zero during TVO_p (VO_p)	NMT 13 mv

TVO_p = 0.50 to 0.60 after the 10% (Rise) of input current waveform.
(Interval during which VO_p is measured).

3-3.2 Environmental Requirements. The module shall be operated with the case ungrounded in accordance with the requirements specified in sections 3-3.1.2 thru 3-3.1.3 when the ambient temperatures are 0° ± 2°C and 65° ± 2°C. Operation of the Erasable Memory Module under the temperature extremes specified herein is for verification of good workmanship. Only intermittent test results, shorts, or open circuits shall indicate a malfunction within the module.

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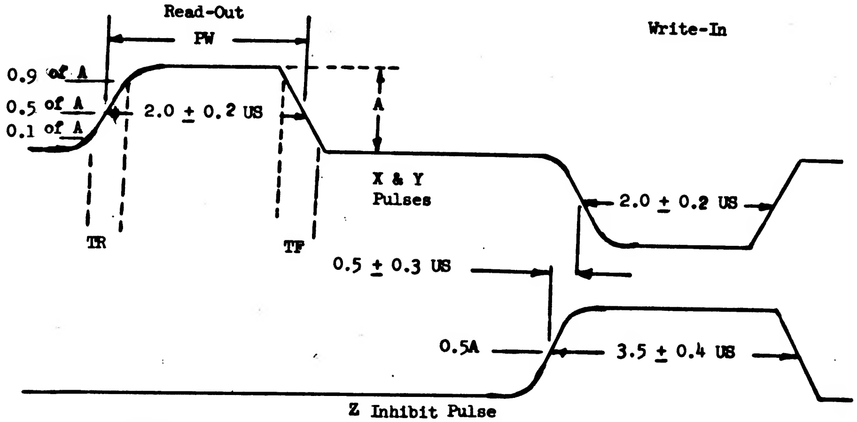

FIGURE 1. Input Waveform Characteristics.

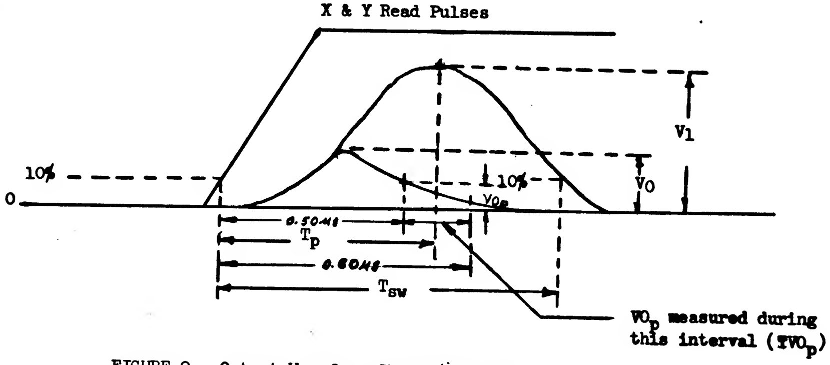

FIGURE 2. Output Waveform Characteristics.

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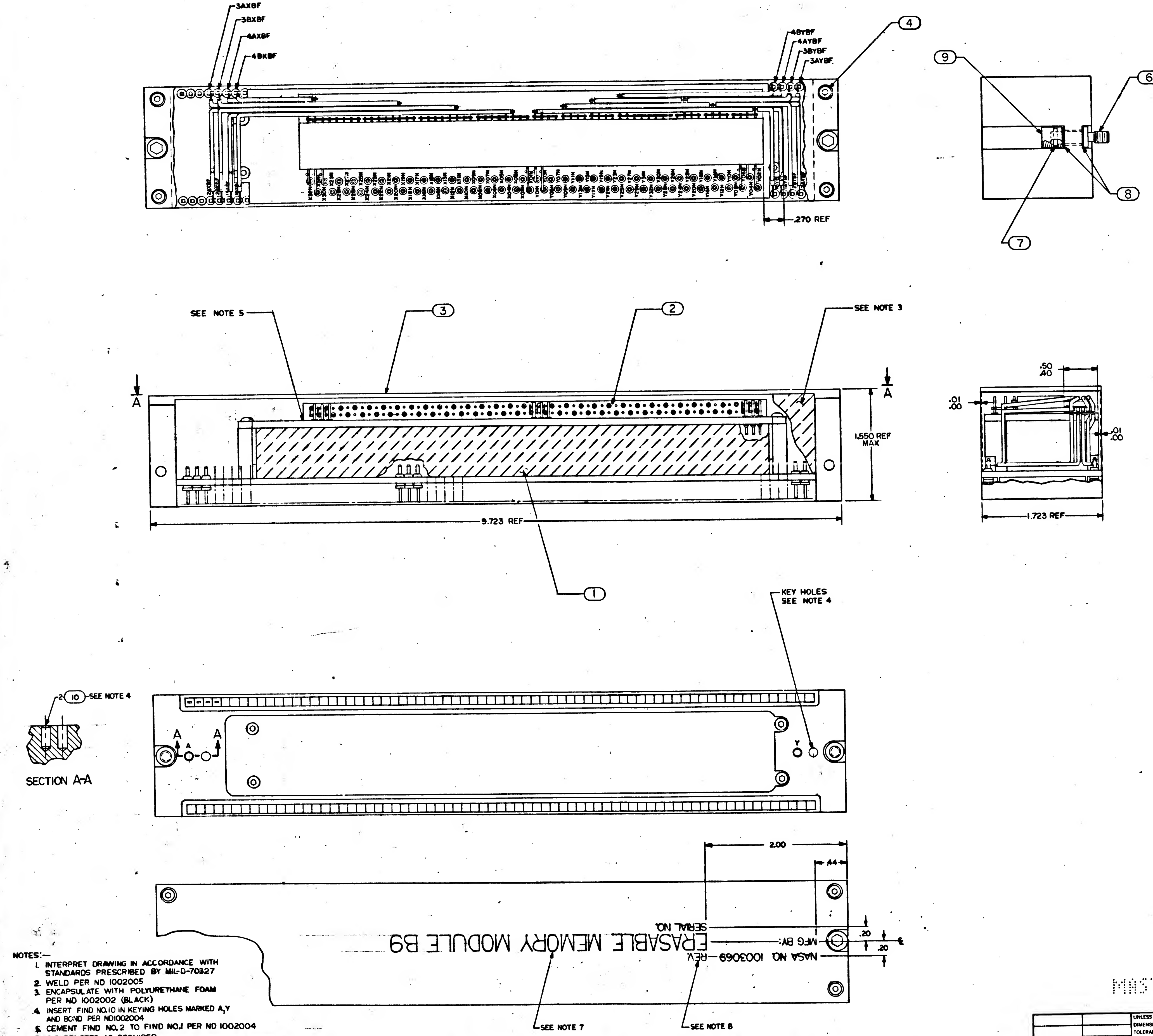
REVISIONS

SYM	DESCRIPTION S-00436	DATE	APPROVAL
A	CHANGED PER TDRR 01170	5-8-63	[illegible]
B	REVISED AND UPGRADED FOR CLASS A RELEASE 01822	7/2/63	[illegible]
C	REVISED PER TDRR 02703	9/24/0	[illegible]



NOTES:—

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005
3. ENCAPSULATE WITH POLYURETHANE FOAM PER ND 1002002 (BLACK)
4. INSERT FIND NO.10 IN KEYING HOLES MARKED A,Y AND BOND PER ND1002004
5. CEMENT FIND NO.2 TO FIND NO.1 PER ND 1002004
6. A R DENOTES AS REQUIRED
7. MARK .250 HIGH WHITE PER ND1002019 LOCATE AS SHOWN
8. MARK .093 HIGH WHITE PER ND1002019 LOCATE AS SHOWN

MASTER

LIST OF MATERIALS

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
2	1004117	PLUG, KEYING	10
2	1004207	DRIVE CYLINDER EJECTION SCREW	9
4	1004206	WASHER, THRUST	8
2	MS39086-100	PIN SPRING, SPIRAL	7
2	1004205	SCREW, EJECTION	6
4	1000093-1	2-56 UNC BUTTON HD SOCKET SCREW	4
1	1004190	COVER, ERASABLE MEMORY MODULE	3
1	1003070	DIODE BLOCK ASSEMBLY	2
1	1003068	ERASABLE MEMORY CORE STACK, ASSY	1

NEXT ASSY	USED ON
APPLICATION	

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FRACTIONS ± — DECIMALS ±.005 .02 ANGLES ± —
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DRAWN [illegible] DATE 12/3/62
CHECKED [illegible] 12/3/62
APPROVAL [illegible] 2/19/63
APPROVAL [illegible] 2/19/63
NASA APPROVAL [illegible] 2/20/63
MIT APPROVAL [illegible]

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY
MODULE B9
ASSEMBLY

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003069
SCALE 2/1
WT —
SHEET 1 OF 1

1003069 C

INCHES
PHOTOGRAPHIC SCALE ONLY

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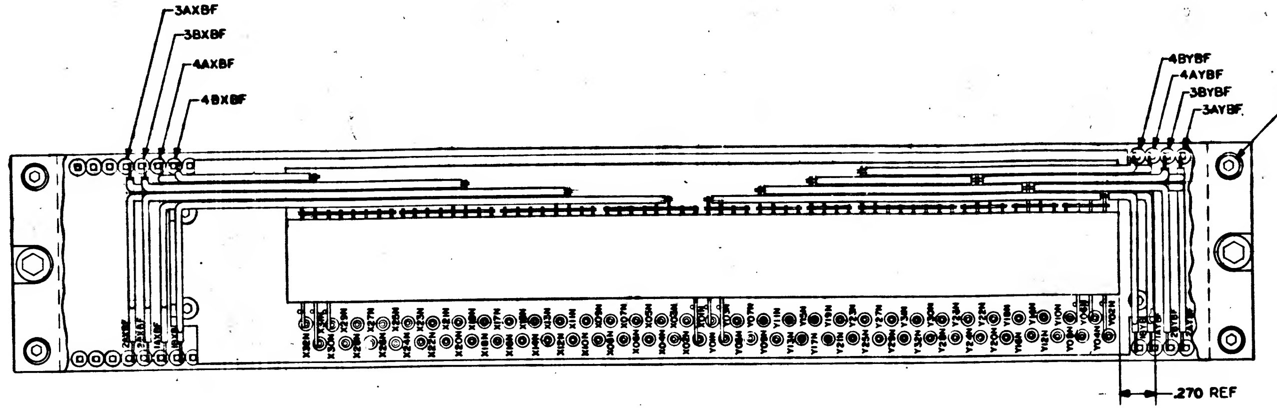
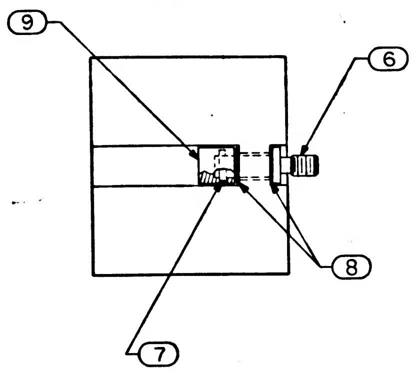
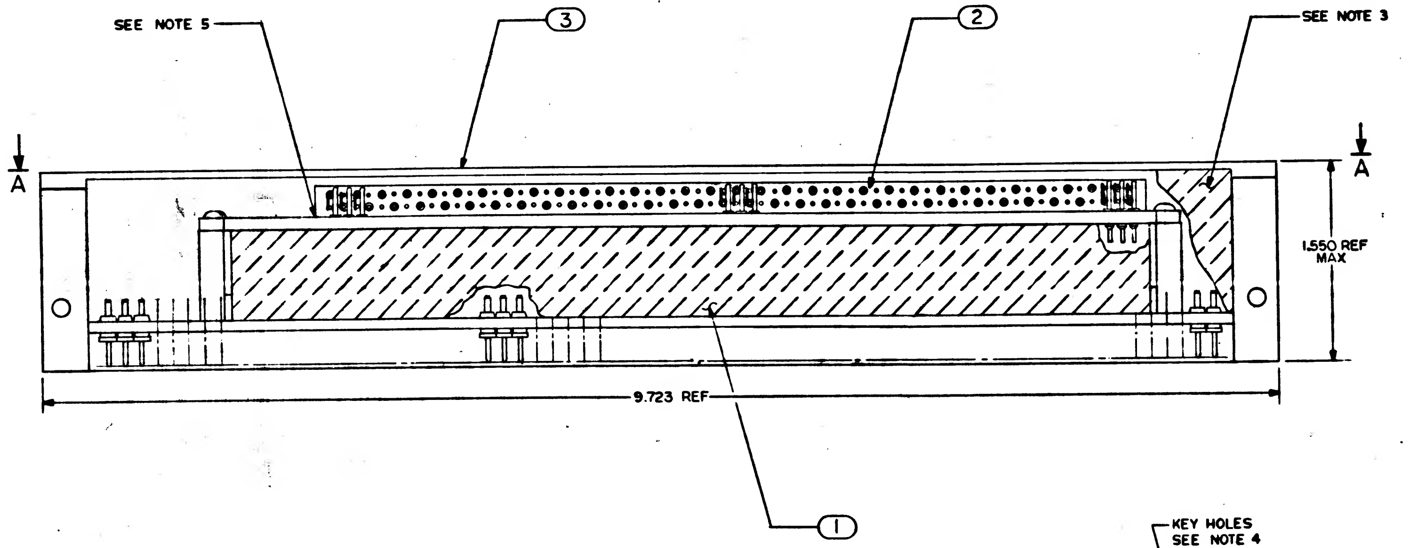
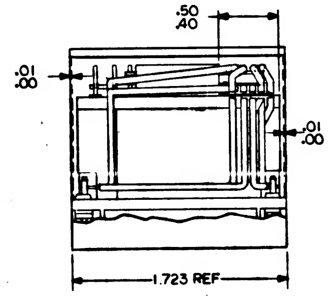
REVISIONS

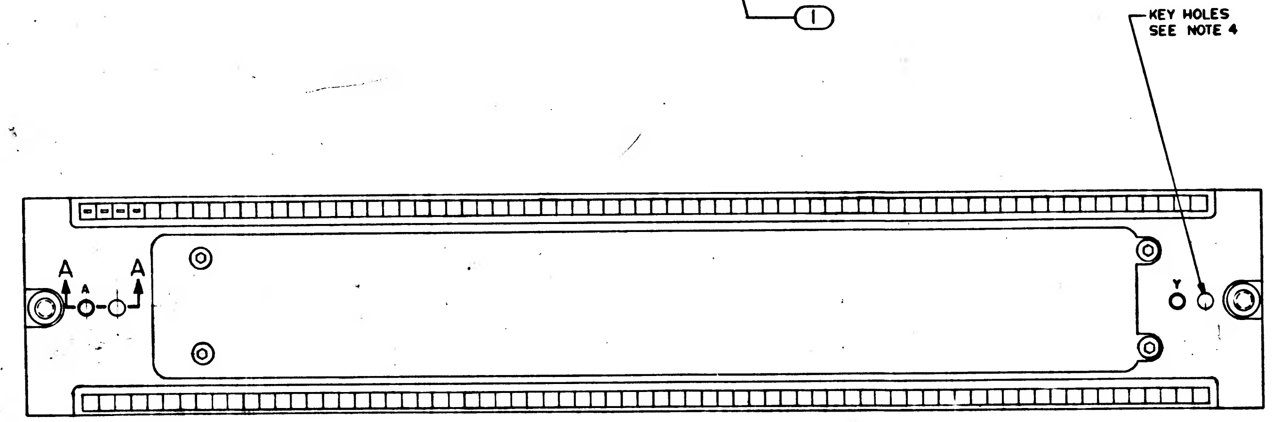
SYM	DESCRIPTION B-00436	DATE	APPROVAL
A	CHANGED PER TDRR 01170	5-8-63	WK
B	REVISED AND UPGRADED FOR CLASS A RELEASE 01822	7/2/63	
C	REVISED PER TDRR 02703	8/21/63	
D	REVISED PER TDRR 03644		WK

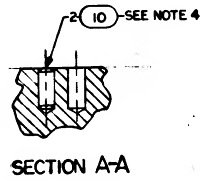




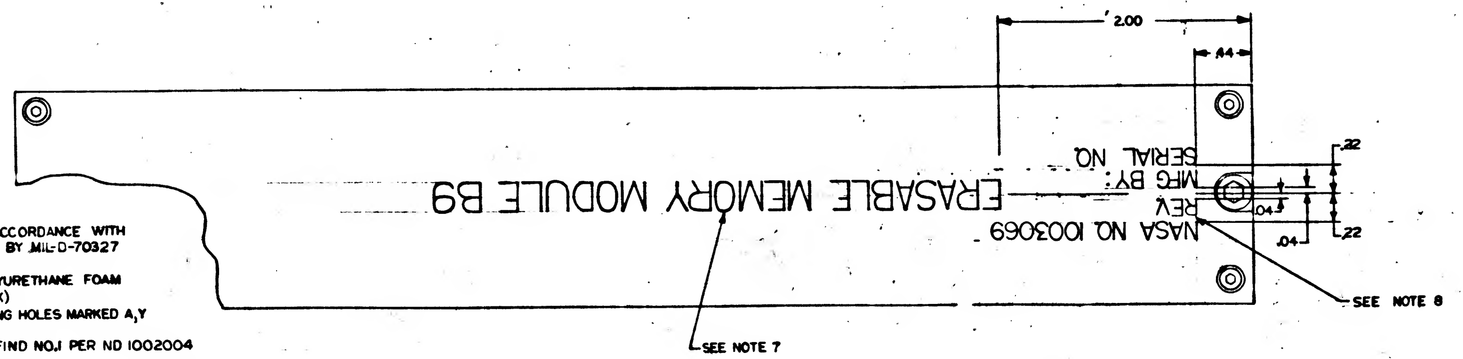








SECTION A-A



NOTES:—

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005
3. ENCAPSULATE WITH POLYURETHANE FOAM PER ND 1002002 (BLACK)
4. INSERT FIND NO.10 IN KEYING HOLES MARKED A,Y AND BOND PER ND1002004
5. CEMENT FIND NO. 2 TO FIND NO.1 PER ND 1002004
6. A R DENOTES AS REQUIRED
7. MARK .250 HIGH WHITE PER ND1002019 LOCATE AS SHOWN.
8. MARK .093 HIGH WHITE PER ND1002019 LOCATE AS SHOWN

MASTER

LIST OF MATERIALS

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
2	1004117	PLUG, KEYING	10
2	1004207	DRIVE CYLINDER EJECTION SCREW	9
4	1004206	WASHER, THRUST	8
2	MS39086-100	PIN SPRING, SPIRAL	7
2	1004205	SCREW, EJECTION	6
4	1000093-1	2-56 UNC BUTTON HD SOCKET SCREW	4
1	1004190	COVER, ERASABLE MEMORY MODULE	3
1	1003070	DIODE BLOCK ASSEMBLY	2
1	1003068	ERASABLE MEMORY CORE STACK, ASSY	1

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± —
DECIMALS ±.005 .02
ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO.
CONTRACT
DRAWN Bonanno DATE 8/9/62
CHECKED 12/2/62
APPROVAL W.F. Jurcas 2/19/63
APPROVAL 2/18/63
NASA APPROVAL 2/20/63
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY MODULE B9 ASSEMBLY

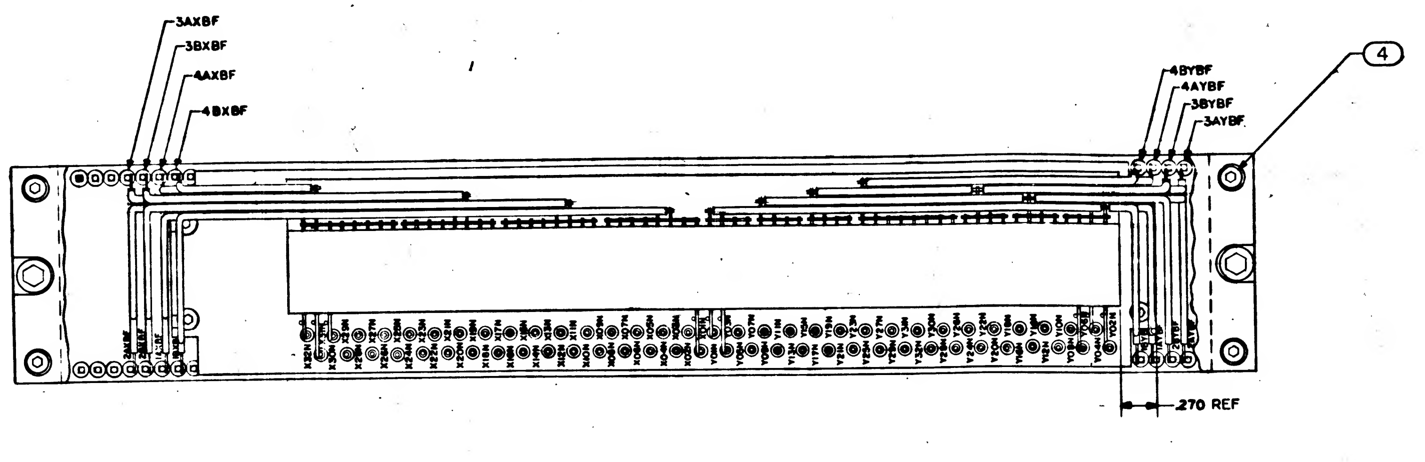
CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003069
SCALE 2/1
WT —
SHEET 1 OF 1

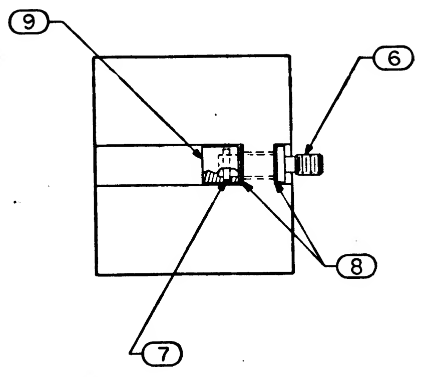
1003069 D

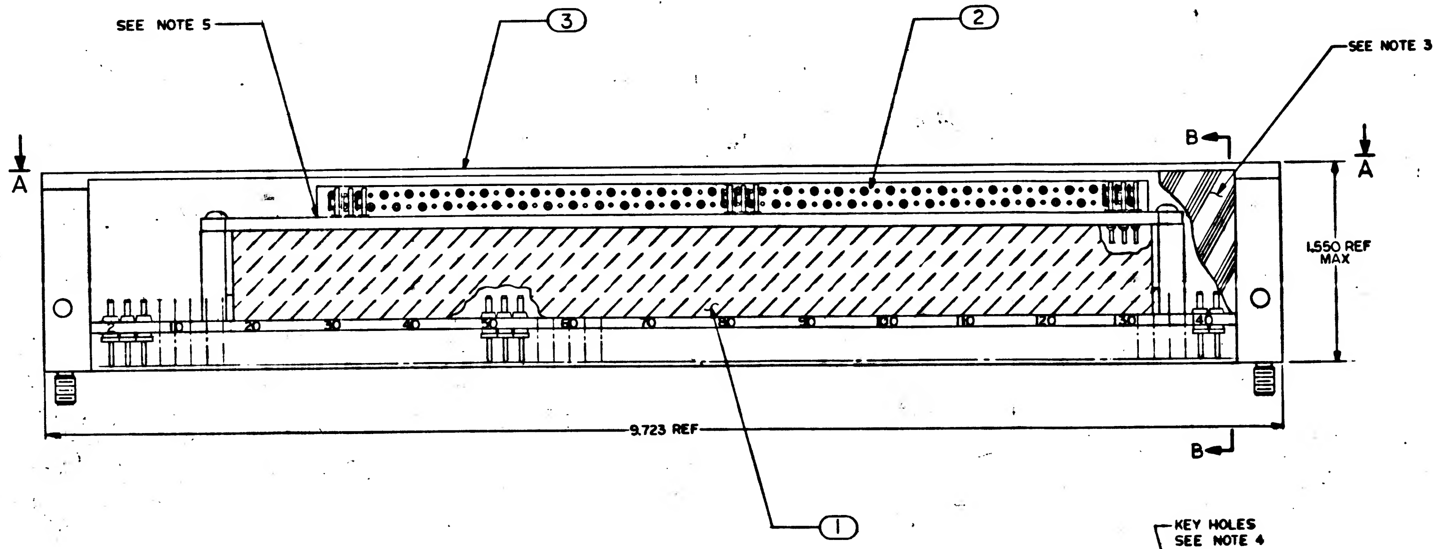
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

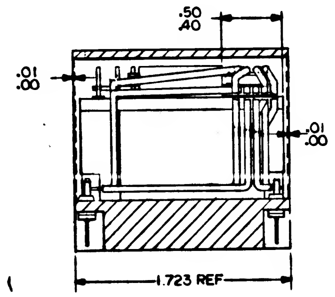
REVISIONS

SYM	DESCRIPTION B-0045	DATE	APPROVAL
A	CHANGED PER TDRR 01170	5-8-63	WKC
B	REVISED AND UPGRADED FOR CLASS A RELEASE 01822	7/21/63	
C	REVISED PER TDRR 02703	8/21/63	
D	REVISED PER TDRR 03644	10/8/63	WK
E	REVISED PER TDRR 04321		WK

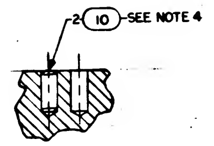




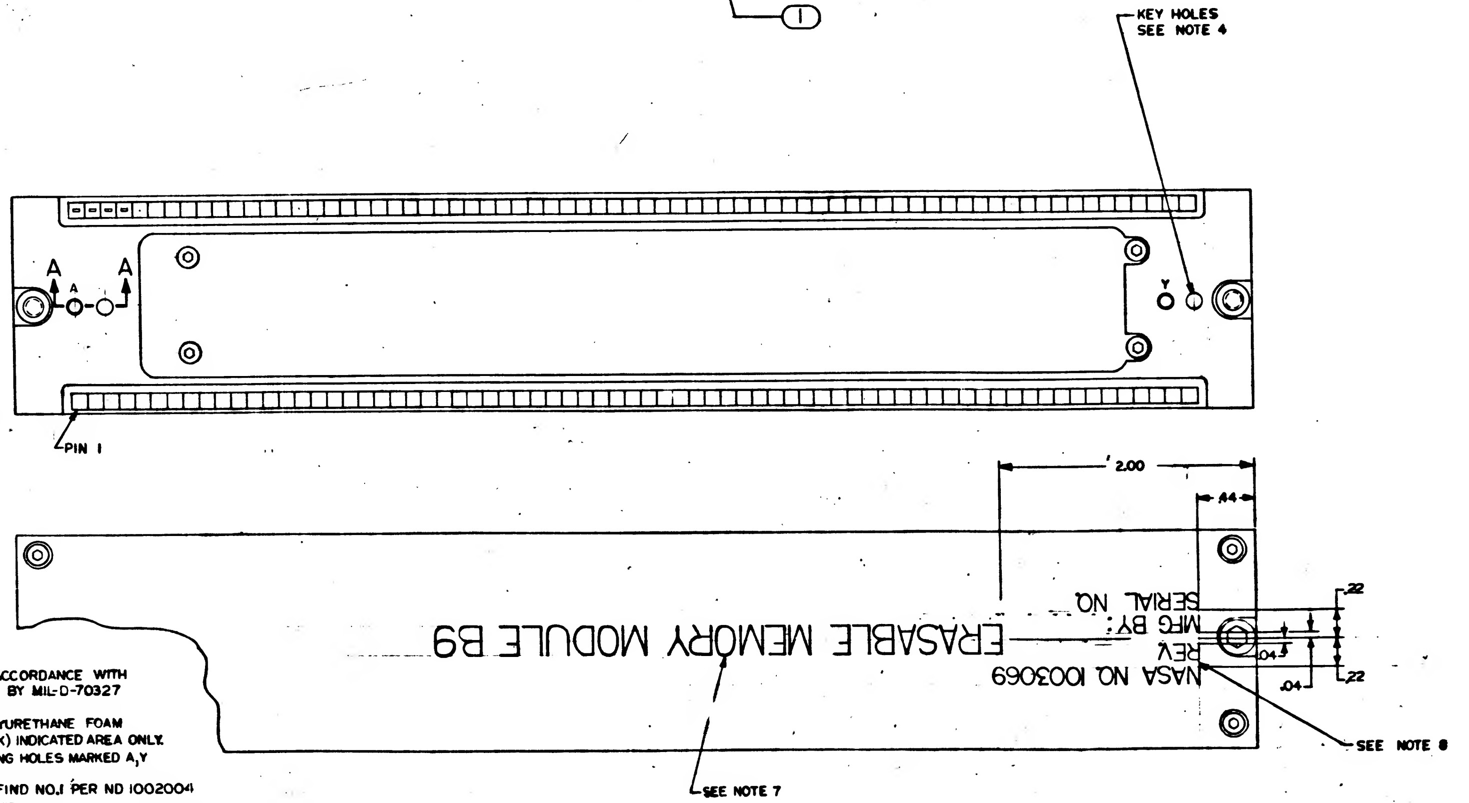




SECTION B-B



SECTION A-A



VIEW A A

NOTES:—
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005
3. ENCAPSULATE WITH POLYURETHANE FOAM PER ND 1002002 (BLACK) INDICATED AREA ONLY.
4. INSERT FIND NO.10 IN KEYING HOLES MARKED A, Y AND BOND PER ND1002004
5. CEMENT FIND NO.2 TO FIND NO.1 PER ND 1002004
6. A R DENOTES AS REQUIRED
7. MARK .250 HIGH WHITE PER ND1002019 LOCATE AS SHOWN
8. MARK .093 HIGH WHITE PER ND1002019 LOCATE AS SHOWN

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
2	1004117	PLUG, KEYING	10
2	1004207	DRIVE CYLINDER EJECTION SCREW	9
4	1004206	WASHER, THRUST	8
2	MS39086-100	PIN SPRING, SPIRAL	7
2	1004205	SCREW, EJECTION	6
4	1000093-1	2-56 UNC BUTTON HD SOCKET SCREW	4
1	1004190	COVER, ERASABLE MEMORY MODULE	3
1	1003070	DIODE BLOCK ASSEMBLY	2
1	1003068	ERASABLE MEMORY CORE STACK, ASSY	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 .02 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT
DRAWN DATE 2/8/62
CHECKED 12/2/62
APPROVAL W. Tyner 2/19/63
APPROVAL 2/18/63
NASA APPROVAL 2/20/63
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY
MODULE B9
ASSEMBLY

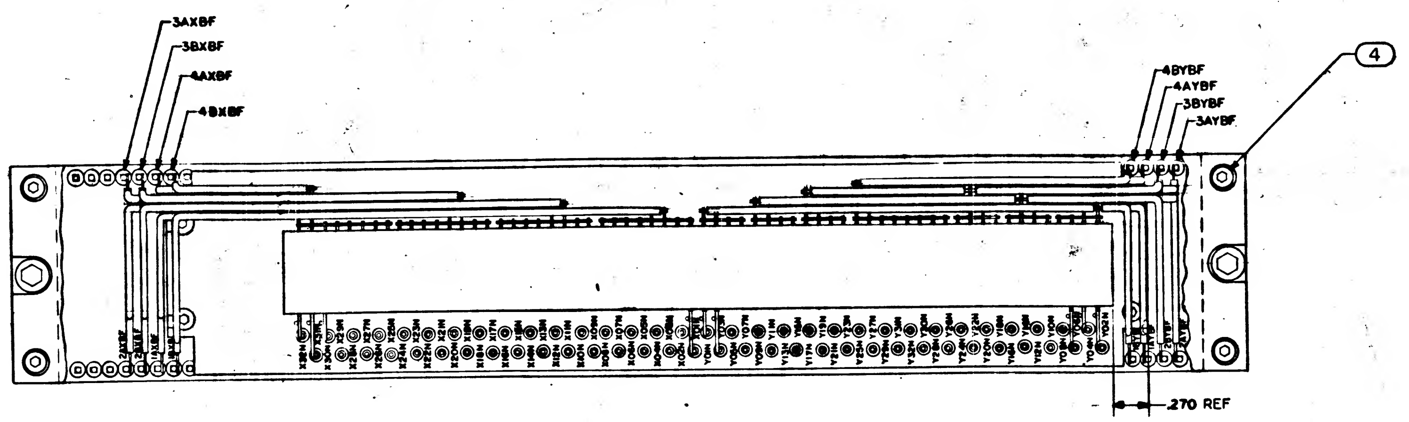
CODE IDENT NO. — SIZE E NASA DRAWING NO. 1003069
SCALE 2/1 WT — SHEET 1 OF 1

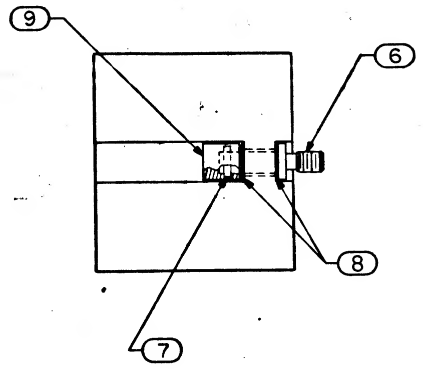
1003069 E

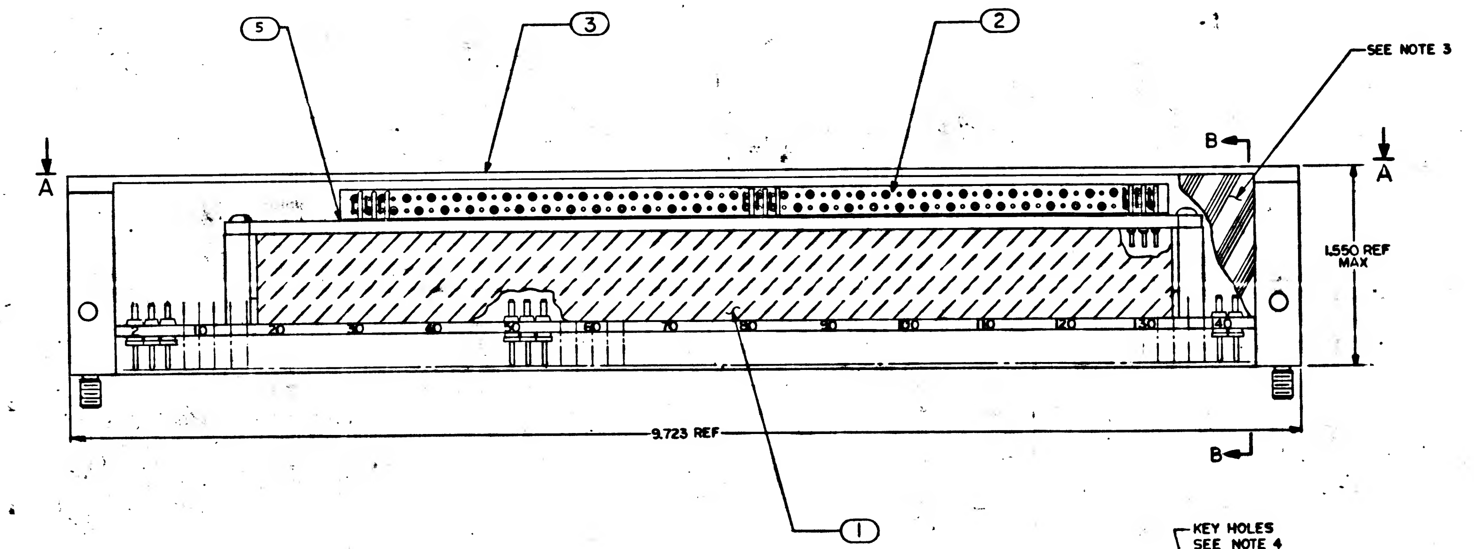
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED FURNISHED OR IN ANY WAY SUPPLIED THE SAID DRAWINGS SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

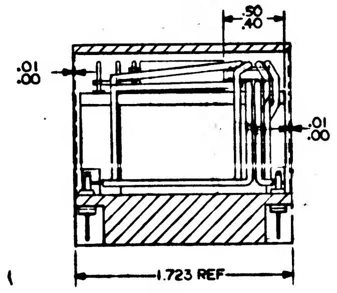
REVISIONS

SYM	DESCRIPTION B-00436	DATE	APPROVAL
A	CHANGED PER TDRR 01170	5-8-63	[illegible]
B	REVISED AND UPGRADED FOR CLASS A RELEASE 01822	7/2/63	[illegible]
C	REVISED PER TDRR 02703	8/2/63	[illegible]
D	REVISED PER TDRR 03644	10/8/63	WR
E	REVISED PER TDRR 04321	10-30-63	WK
F	REVISED PER TDRR 04610	11-13-63	[illegible]

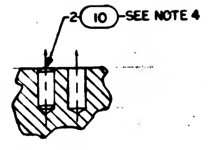




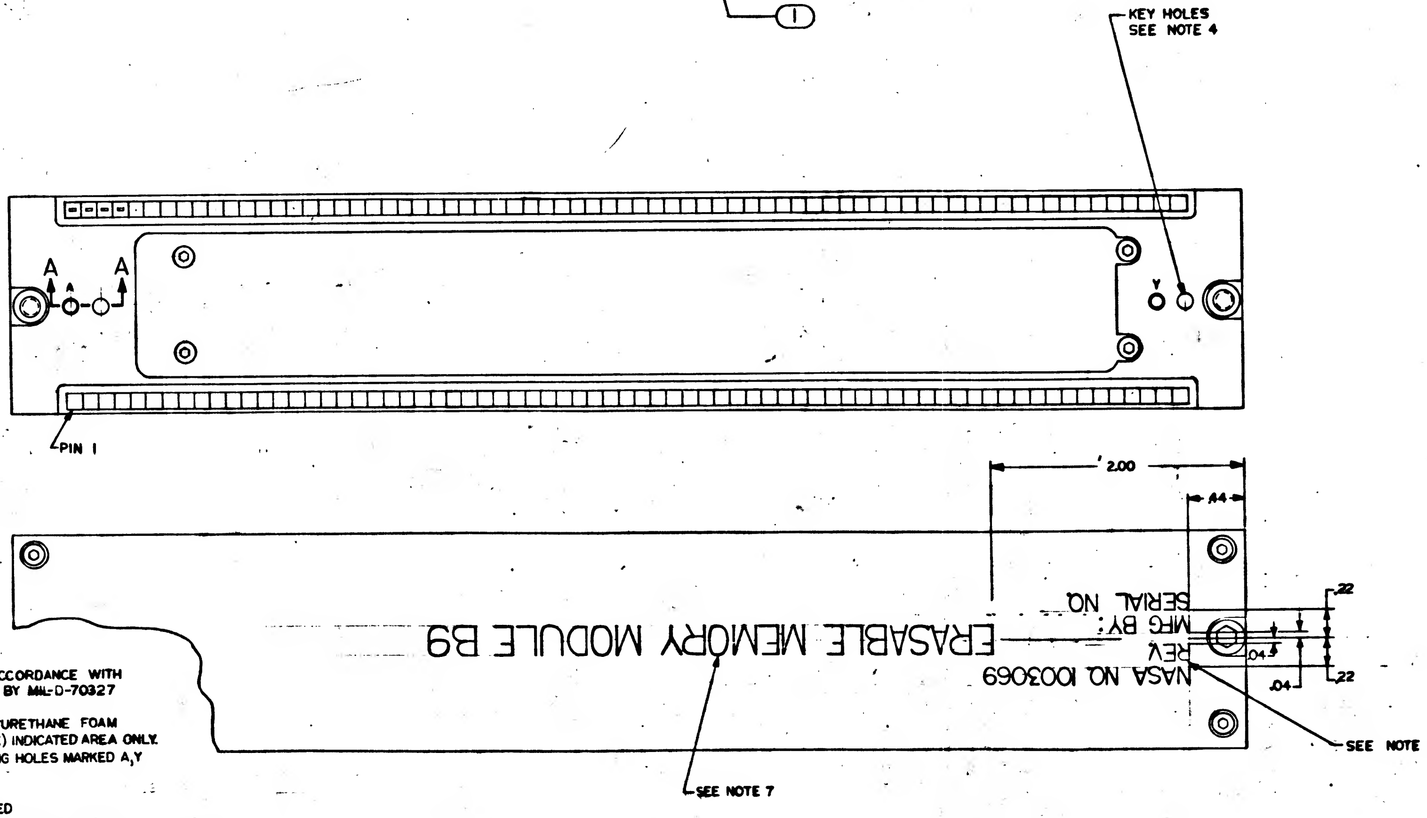




SECTION B-B



SECTION A-A



VIEW A A

NOTES:—

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005
3. ENCAPSULATE WITH POLYURETHANE FOAM PER ND 1002002 (BLACK) INDICATED AREA ONLY.
4. INSERT FIND NO.10 IN KEYING HOLES MARKED A,Y AND BOND PER ND1002004

6. A R DENOTES AS REQUIRED
7. MARK .250 HIGH WHITE PER ND1002019 LOCATE AS SHOWN
8. MARK .093 HIGH WHITE PER ND1002019 LOCATE AS SHOWN

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
2	1004117	PLUG, KEYING	10
2	1004207	DRIVE CYLINDER EJECTION SCREW	9
4	1004206	WASHER, THRUST	8
2	MS39086-100	PIN SPRING, SPIRAL	7
2	1004205	SCREW, EJECTION	6
AR	1006806-3	6 1/2 X .600 WIDE DOUBLE SIDED "A" E	5
4	1000093-1	2-56 UNC BUTTON HD SOCKET SCREW	4
1	1004190	COVER, ERASABLE MEMORY MODULE	3
1	1003070	DIODE BLOCK ASSEMBLY	2
1	1003068	ERASABLE MEMORY CORE STACK, ASSY	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 .02 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO CONTRACT
DRAWN [illegible] DATE 12/4/62
CHECKED [illegible] 12/4/62
APPROVAL W Turner 2/19/63
APPROVAL [illegible] 2/19/63
NASA APPROVAL [illegible] 2/20/63
MIT APPROVAL [illegible]

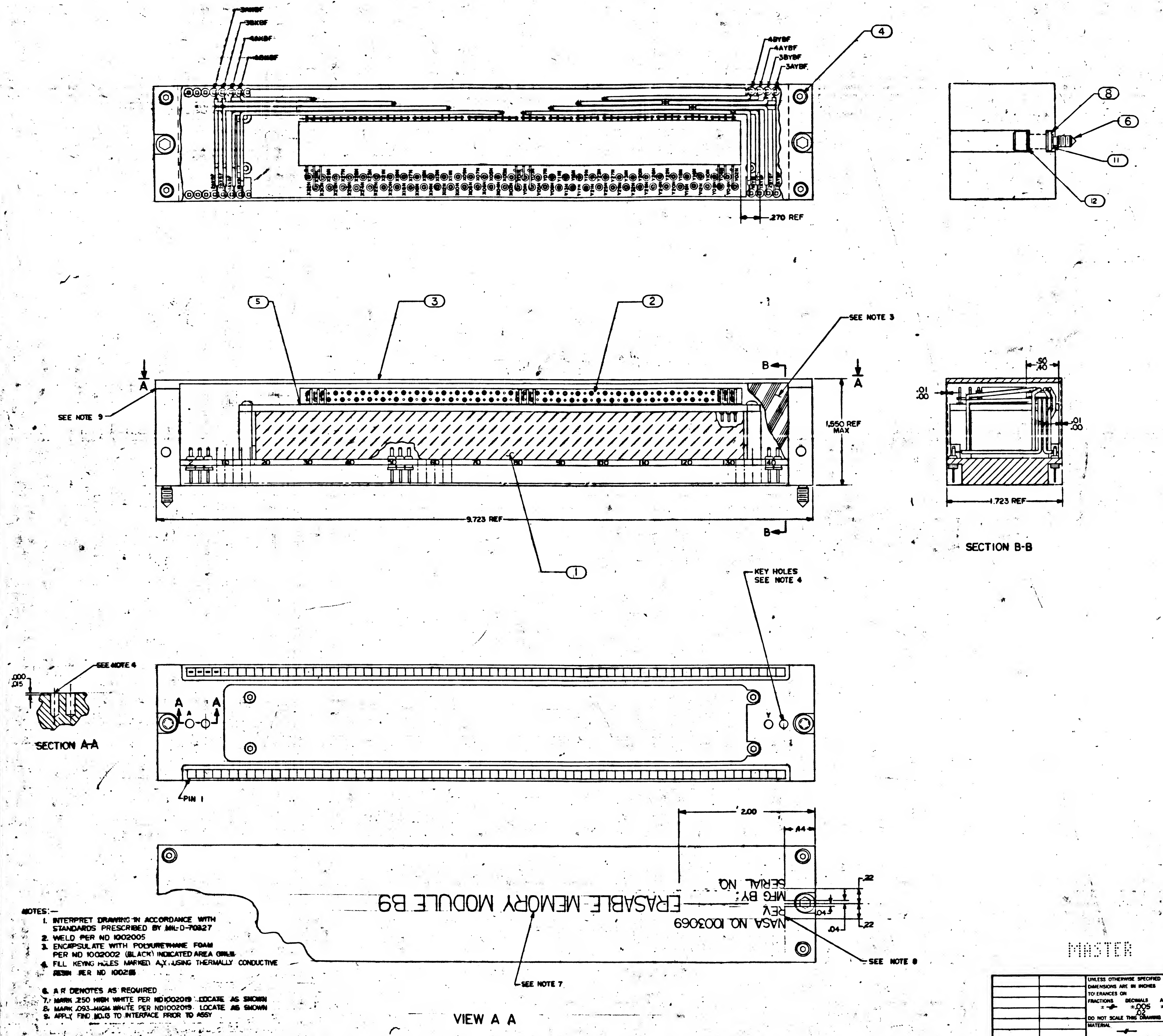
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY
MODULE B9
ASSEMBLY

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003069
SCALE 2/1
WT —
SHEET 1 OF 1

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

SYM	DESCRIPTION 13-0045	DATE	APPROVAL
A	CHANGED PER TDRR 01198	5-8-63	20 WH
B	REVISED AND UPGRADED FOR CLASS I RELEASE 01822	7/2/63	[illegible]
C	REVISED PER TDRR 02703	9/24/63	[illegible]
D	REVISED PER TDRR 03644	[illegible]	WK
E	REVISED PER TDRR 04321	10-20-63	WK
F	REVISED PER TDRR 04610	11-13-63	WK
G	REVISED PER TDRR 04728	[illegible]	[illegible]



NOTES:—

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005
3. ENCAPSULATE WITH POLYURETHANE FOAM PER ND 1002002 (BLACK) INDICATED AREA ONLY
4. FILL KEYING HOLES MARKED A,X USING THERMALLY CONDUCTIVE RESIN PER ND 100265

6. A R DENOTES AS REQUIRED
7. MARK .250 HIGH WHITE PER ND1002019 LOCATE AS SHOWN
8. MARK .093 HIGH WHITE PER ND1002019 LOCATE AS SHOWN
9. APPLY FIND NO.13 TO INTERFACE PRIOR TO ASSY

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1006879	SILCONE COMPOUND THERMOCONDUCTIVE	13
2	1004546-1	WASHER FLAT	12
2	MS 6633-405	RING RETAINING EXTERNAL "E"	11
~~2~~	~~1004117~~	~~PLUG, KEYING~~	~~10~~
~~2~~	~~1004207~~	[illegible]	~~9~~
2	1004546-3	WASHER, FLAT	8
~~2~~	[illegible]	[illegible]	~~7~~
2	1004579-1	SCREW, JACKING	6
AR	1006806-3	6 72 X .500 WIDE DOUBLE SIDED TAPE	5
4	1000093-1	2-56 UNC BUTTON HD SOCKET SCREW	4
1	1004190	COVER, ERASABLE MEMORY MODULE	3
1	1003070	DIODE BLOCK ASSEMBLY	2
1	1003068	ERASABLE MEMORY CORE STACK, ASSY	1

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 .02 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

M I T
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN [illegible] DATE 12/3/62
CHECKED [illegible] 12/3/62
APPROVAL W.V. Jursa 2/19/63
APPROVAL SD Feagans 2/19/63
NASA APPROVAL Jack Barnard 2/20/63
MIT APPROVAL [illegible] 2/21/63

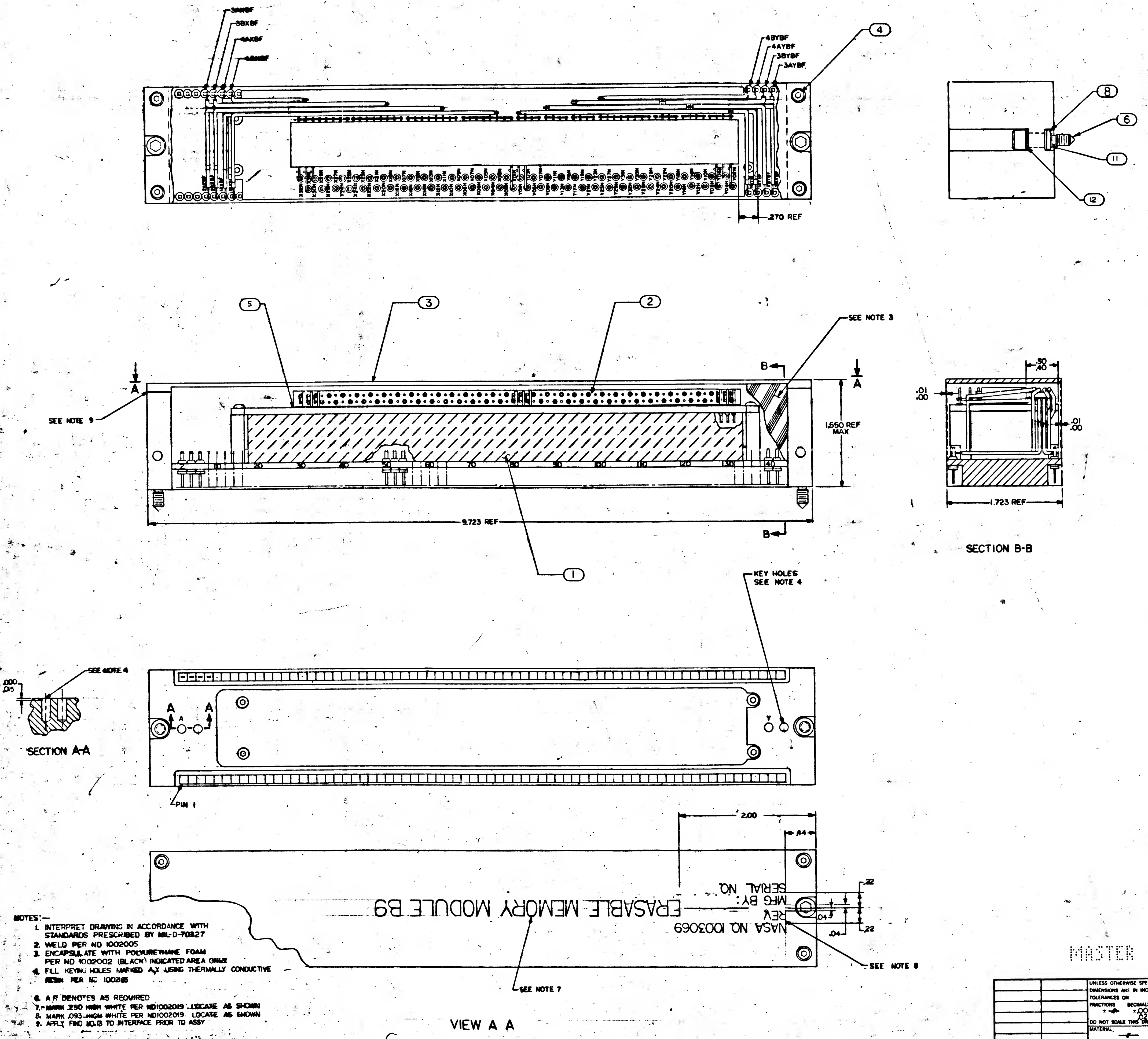
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY MODULE B9 ASSEMBLY

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003069
SCALE 2/1
WT —
SHEET 1 OF 1

INCHES
PHOTOGRAPHIC SCALE ONLY

SYM	REVISIONS DESCRIPTION B-00[illegible]	DATE	APPROVAL
A	CHANGED PER TDRR 01190	5-8-63	RR WK
B	REVISED AND UPGRADED FOR CLASS A RELEASE 01822	[illegible]	[illegible]
C	REVISED PER TDRR 02703	[illegible]	[illegible]
D	REVISED PER TDRR 03644	8 Oct 63	WK
E	REVISED PER TDRR 0432[illegible]	[illegible]	WK
F	REVISED PER TDRR 04610	11-13-63	WK
G	REVISED PER TDRR 04728	[illegible]	[illegible]
H	REVISED PER TDRR 05637	[illegible]	[illegible]



NOTES:—

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005
3. ENCAPSULATE WITH POLYURETHANE FOAM PER ND 1002002 (BLACK) INDICATED AREA ONLY
4. FILL KEYING HOLES MARKED A,Y USING THERMALLY CONDUCTIVE RESIN PER NC 1002185

6. A R DENOTES AS REQUIRED
7. MARK .250 HIGH WHITE PER ND1002019 LOCATE AS SHOWN
8. MARK .093-HIGH WHITE PER ND1002019 LOCATE AS SHOWN
9. APPLY FIND NO.13 TO INTERFACE PRIOR TO ASSY

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
X	1006061	SCHEMATIC	REF
AR	1006879	SILICONE COMPOUND THERMOCONDUCTIVE	13
2	1004546-1	WASHER FLAT	12
2	MS 16633-4015	RING RETAINING EXTERNAL "E"	11
~~2~~	~~1004117~~	~~PLUG KEYING~~	~~10~~
~~2~~	~~1004207~~	~~[illegible]~~	~~9~~
2	1004546-3	WASHER, FLAT	8
~~2~~	~~MS [illegible]~~	~~PIN SPRING [illegible]~~	~~7~~
2	1004579-1	SCREW, JACKING	6
AR	1006806-3	6 1/2 X .600 WIDE DOUBLE SIDED TAPE	5
4	1000093-2	2-56 UNC BUTTON HD SOCKET SCREW	4
1	1004190	COVER, ERASABLE MEMORY MODULE	3
1	1003070	DIODE BLOCK ASSEMBLY	2
1	1003068	ERASABLE MEMORY CORE STACK, ASSY	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 .02 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN [illegible] DATE 2/13/62
CHECKED [illegible] 12/3/62
APPROVAL [illegible] 2/19/63
APPROVAL [illegible]
NASA APPROVAL [illegible] 2/20/63
MIT APPROVAL [illegible]

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY MODULE B9
ASSEMBLY

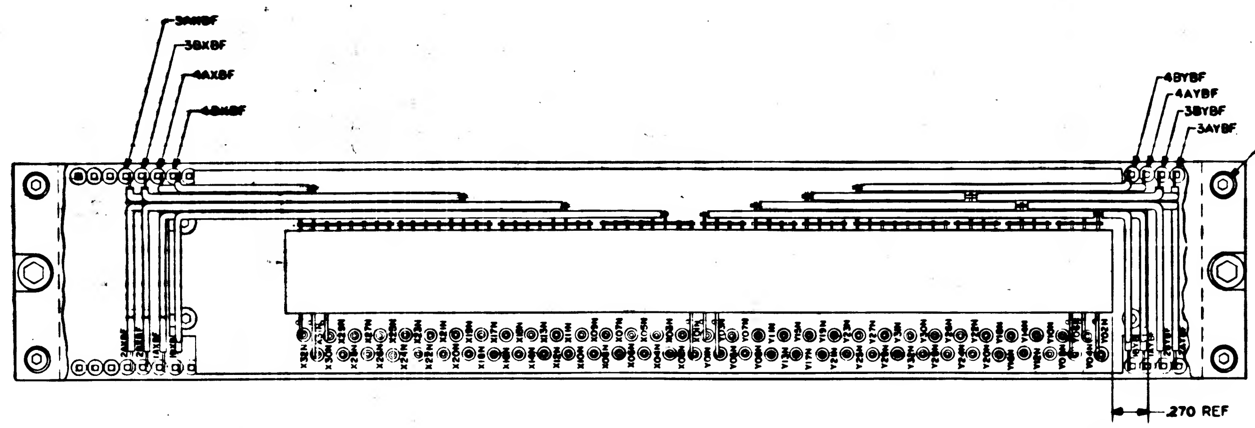
CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003069
SCALE 2/1
WT —
SHEET 1 OF 1

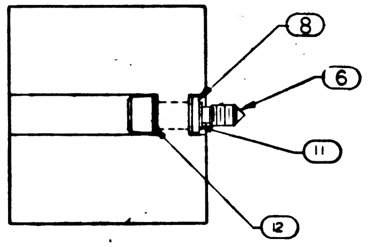
1003069 H

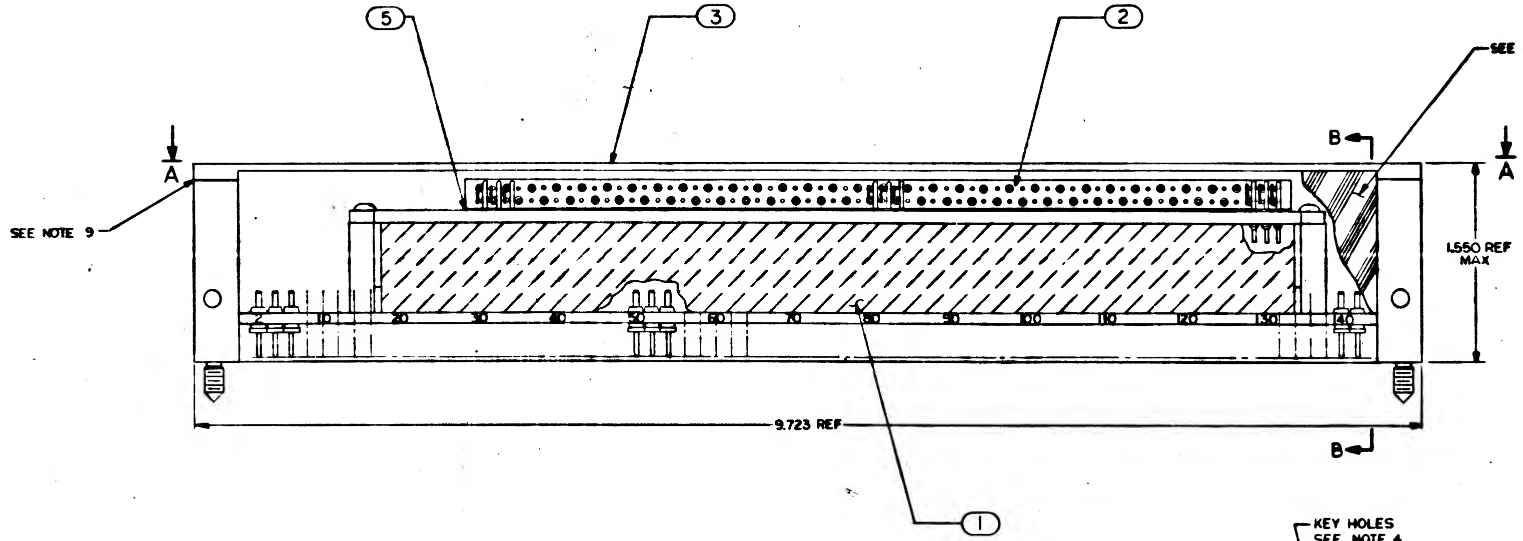
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

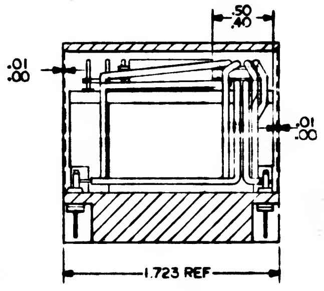
REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
A	CHANGED PER TDRR 01170	5-1-63	WK
B	REVISED AND UPGRADED FOR CLASS A RELEASE 01822	7/2/63	
C	REVISED PER TDRR 02703		
D	REVISED PER TDRR 03644		WK
E	REVISED PER TDRR 0432	10-30-63	WK
F	REVISED PER TDRR 046	11-13-63	WK
G	REVISED PER TDRR 047		
H	REVISED PER TDRR 05637	7 Jan 64	
J	REVISED PER TDRR 08404 DR CHK R.A.E.	5/11/64	

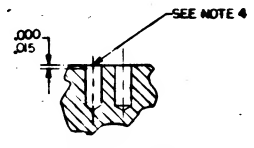




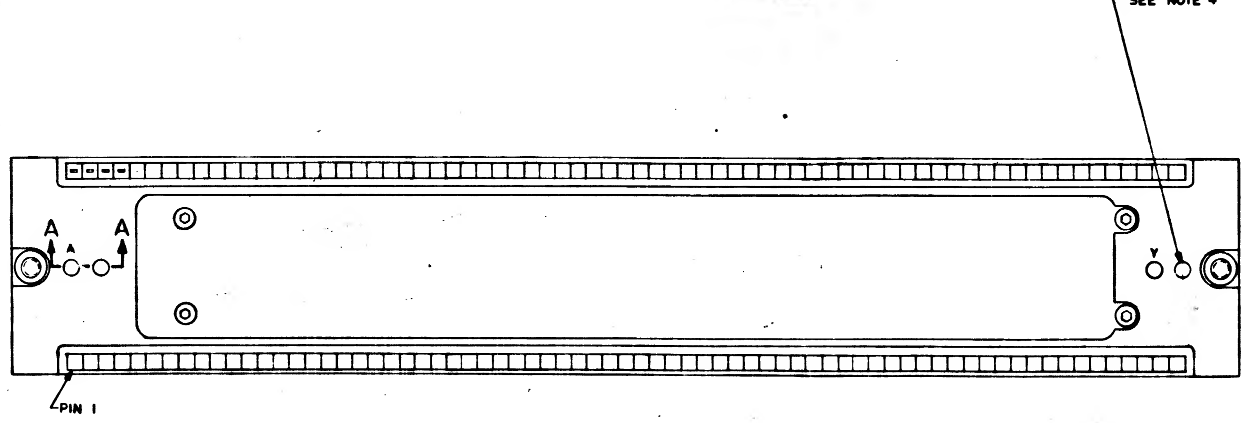


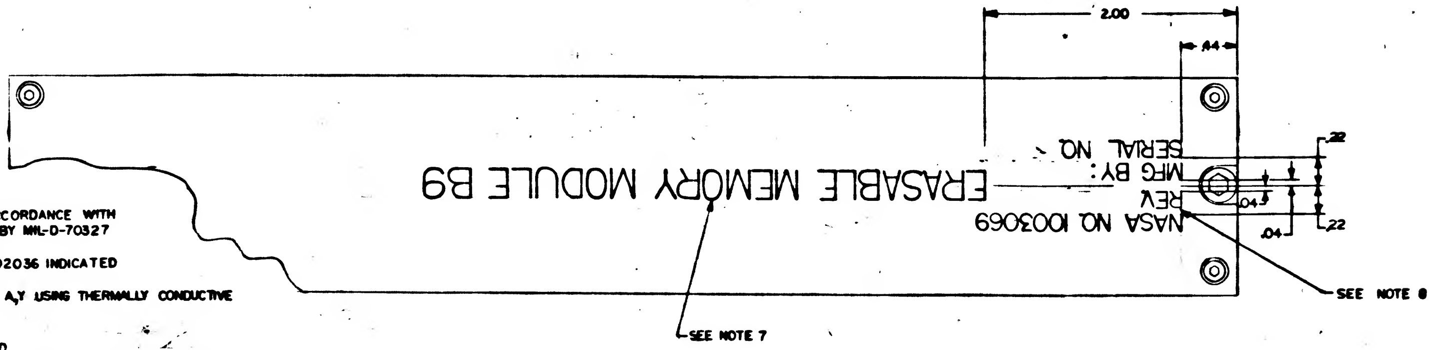


SECTION B-B



SECTION A-A





VIEW A A

NOTES:—

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005
3. ENCAPSULATE PER ND1002036 INDICATED AREA ONLY
4. FILL KEYING HOLES MARKED A,Y USING THERMALLY CONDUCTIVE RESIN PER ND 1002183

6. A R DENOTES AS REQUIRED
7. MARK .250 HIGH WHITE PER ND1002019 LOCATE AS SHOWN
8. MARK .093 HIGH WHITE PER ND1002019 LOCATE AS SHOWN
9. APPLY FIND NO.13 TO INTERFACE PRIOR TO ASSY

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
X	1006061	SCHEMATIC	REF
AR	1006879	SILCONE COMPOUND THERMOCONDUCTIVE	13
2	1004546-1	WASHER, FLAT	12
2	MS 16633-4015	RING RETAINING EXTERNAL "E"	11
~~2~~	~~1004117~~	~~PLUG, KEYING~~	~~10~~
~~2~~	~~1004207~~	~~DRIVE CYLINDER EJECTION SCREW~~	~~9~~
2	1004546-3	WASHER, FLAT	8
~~2~~	~~MS 39086-100~~	~~PIN SPRING SPIRAL~~	~~7~~
2	1004579-1	SCREW, JACKING	6
AR	1006806-3	6 1/2 X .600 WIDE DOUBLE SIDED TAPE	5
4	1000093-2	2-56 UNC BUTTON HD SOCKET SCREW	4
1	1004190	COVER, ERASABLE MEMORY MODULE	3
1	1003070	DIODE BLOCK ASSEMBLY	2
1	1003068	ERASABLE MEMORY CORE STACK, ASSY	1

LIST OF MATERIALS

MASTER

NEXT ASSY	USED ON
1003184	1003186

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 .02 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT
DRAWN DATE 12/3/62
CHECKED 12/11/62
APPROVAL 2/19/63
APPROVAL 2/18/63
NASA APPROVAL 2/20/63
MIT APPROVAL

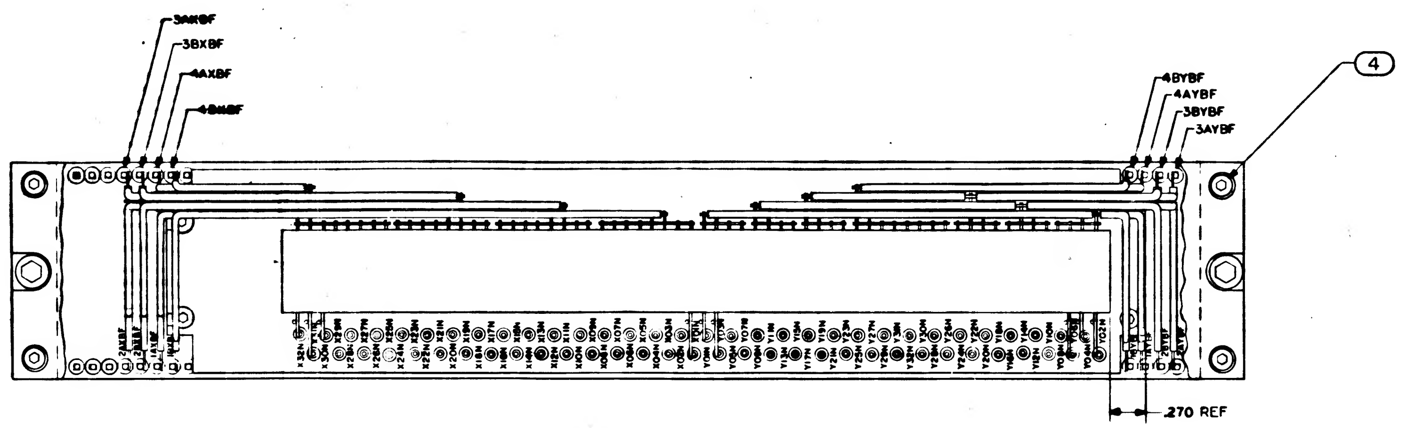
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

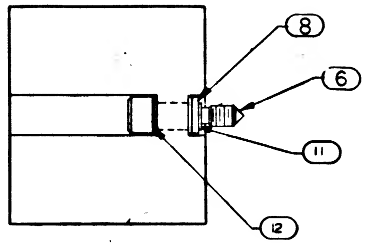
ERASABLE MEMORY
MODULE B9
ASSEMBLY

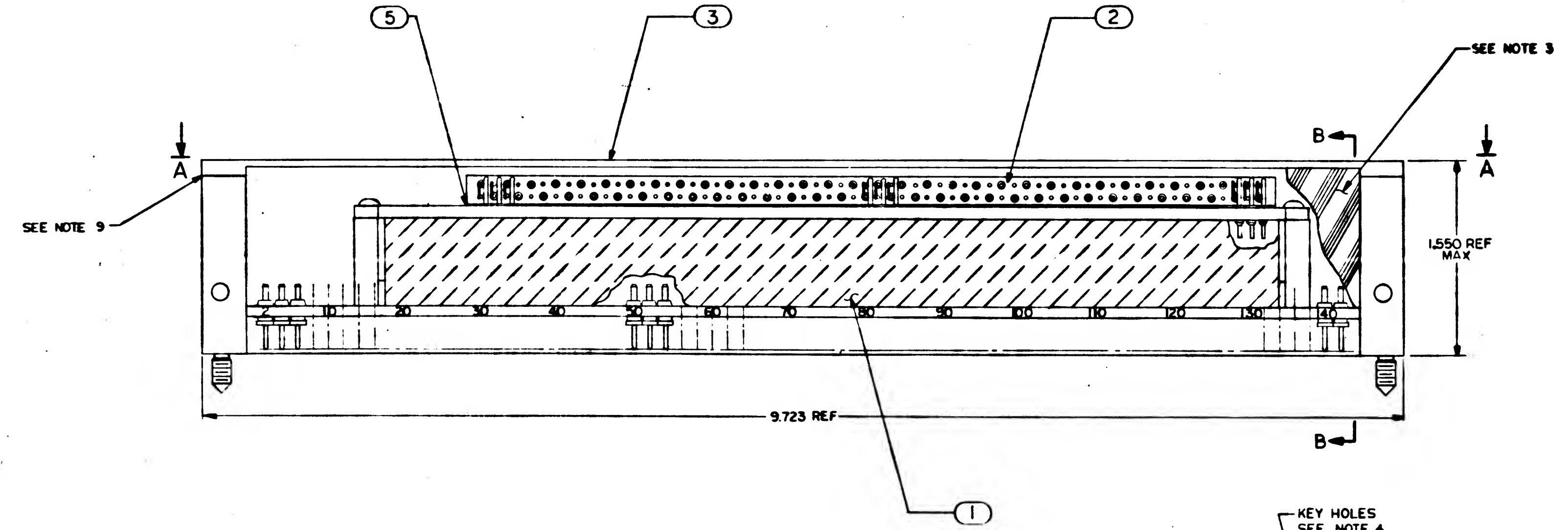
CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003069
SCALE 2/1
WT —
SHEET 1 OF 1

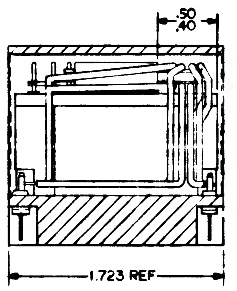
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

REVISIONS			
SYM	DESCRIPTION 00436	DATE	APPROVAL
A	CHANGED PER TDRR 01170	5-4-63	
B	REVISED AND UPGRADED FOR CLASS A RELEASE 01822		
C	REVISED PER TDRR 02703		
D	REVISED PER TDRR 03644		WR
E	REVISED PER TDRR 04321		WR
F	REVISED PER TDRR 04610	11-13-63	WR
G	REVISED PER TDRR 04728		
H	REVISED PER TDRR 05637		
J	REVISED PER TDRR 08404 DR CHK R.B.E.	6/11/64	
K	REVISED PER TDRR 11243 DR CHK OUM	9/14/64	









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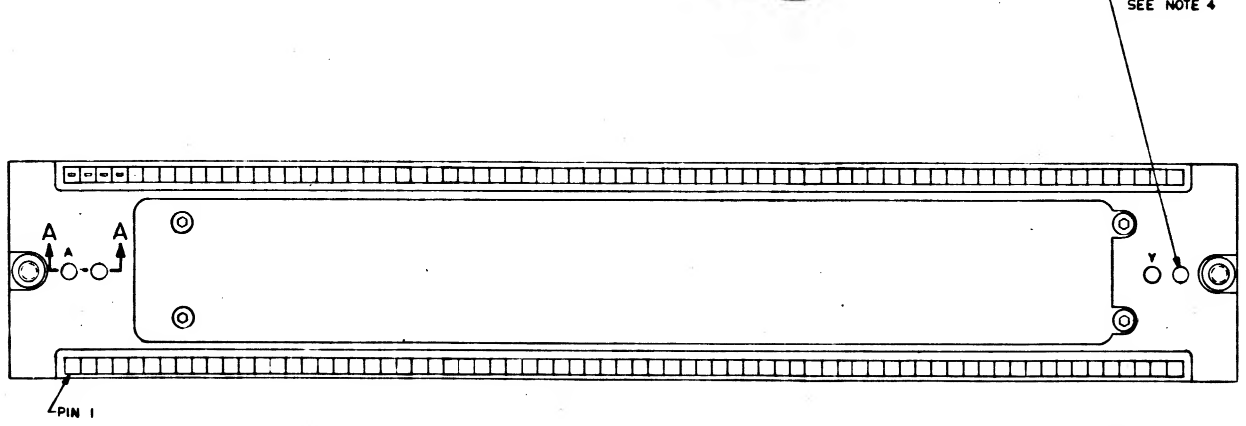
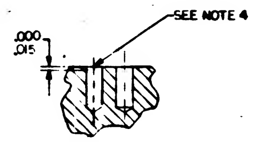
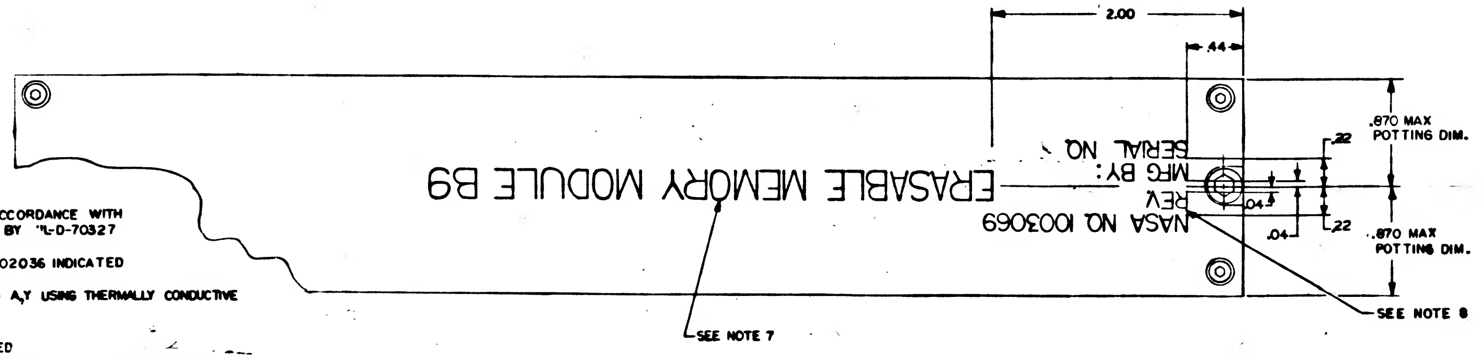




SECTION A-A



NOTES:—

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005
3. ENCAPSULATE PER ND1002036 INDICATED AREA ONLY
4. FILL KEYING HOLES MARKED A,Y USING THERMALLY CONDUCTIVE RESIN PER ND 1002185

6. A R DENOTES AS REQUIRED
7. MARK .250 HIGH WHITE PER ND1002019 LOCATE AS SHOWN
8. MARK .093 HIGH WHITE PER ND1002019 LOCATE AS SHOWN
9. APPLY FIND NO.13 TO INTERFACE PRIOR TO ASSY

VIEW A A

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
X	1006061	SCHEMATIC	REF
AR	1006879	SILCONE COMPOUND THERMOCONDUCTIVE	13
2	1004546-1	WASHER, FLAT	12
2	MS 16633-4015	RING RETAINING EXTERNAL "E"	11
~~2~~	~~1004117~~	~~PLUG, KEYING~~	~~10~~
~~2~~	~~1004207~~	~~DRIVE CYLINDER EJECTION SCREW~~	~~9~~
2	1004546-3	WASHER, FLAT	8
~~2~~	~~MS 39086-100~~	~~PIN SPRING SPIRAL~~	~~7~~
2	1004579-1	SCREW, JACKING	6
AR	1006806-3	6 1/2 X .600 WIDE DOUBLE SIDED TAPE	5
4	1000093-2	2-56 UNC BUTTON HD SOCKET SCREW	4
1	1004190	COVER, ERASABLE MEMORY MODULE	3
1	1003070	DIODE BLOCK ASSEMBLY	2
1	1003068	ERASABLE MEMORY CORE STACK, ASSY	1

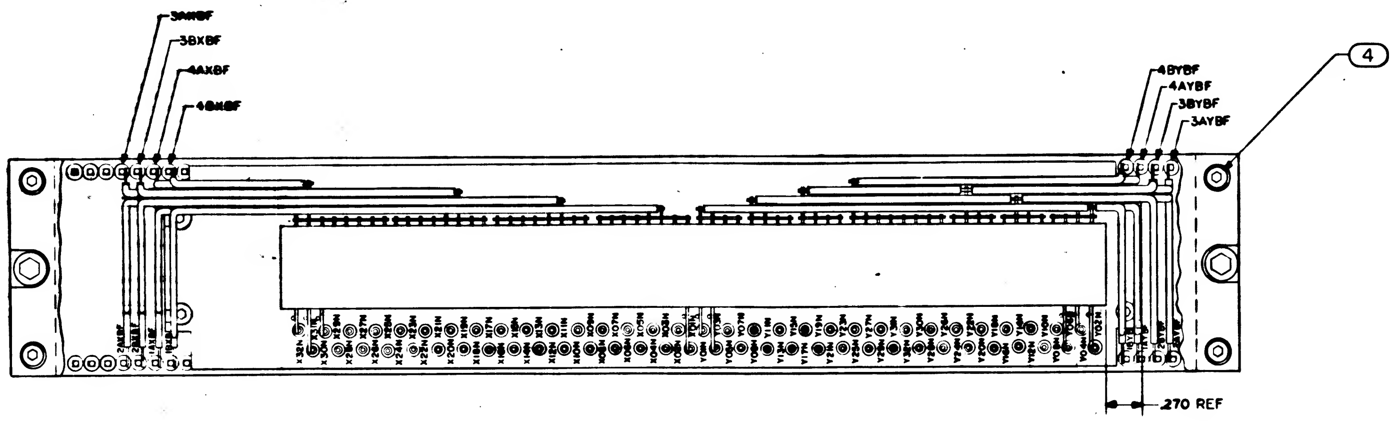
LIST OF MATERIALS

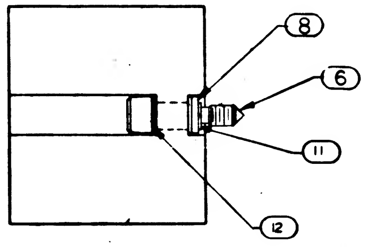
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± — DECIMALS ±.005 .02 ANGLES ± — DO NOT SCALE THIS DRAWING	MIT INSTRUMENTATION LAB CAMBRIDGE, MASS DWG NO CONTRACT	MANNED SPACECRAFT CENTER HOUSTON, TEXAS
		MATERIAL —	DRAWN Bonanno DATE 12/3/62 CHECKED 12/18/62 APPROVAL 2/19/63 APPROVAL	ERASABLE MEMORY MODULE B9 ASSEMBLY
1003184	1003186	HEAT TREATMENT —	NASA APPROVAL 2/20/63	CODE IDENT NO. — SIZE E NASA DRAWING NO. 1003069
NEXT ASSY	USED ON	FINAL FINISH —	MIT APPROVAL	SCALE 2/1 WT — SHEET 1 OF 1
APPLICATION				

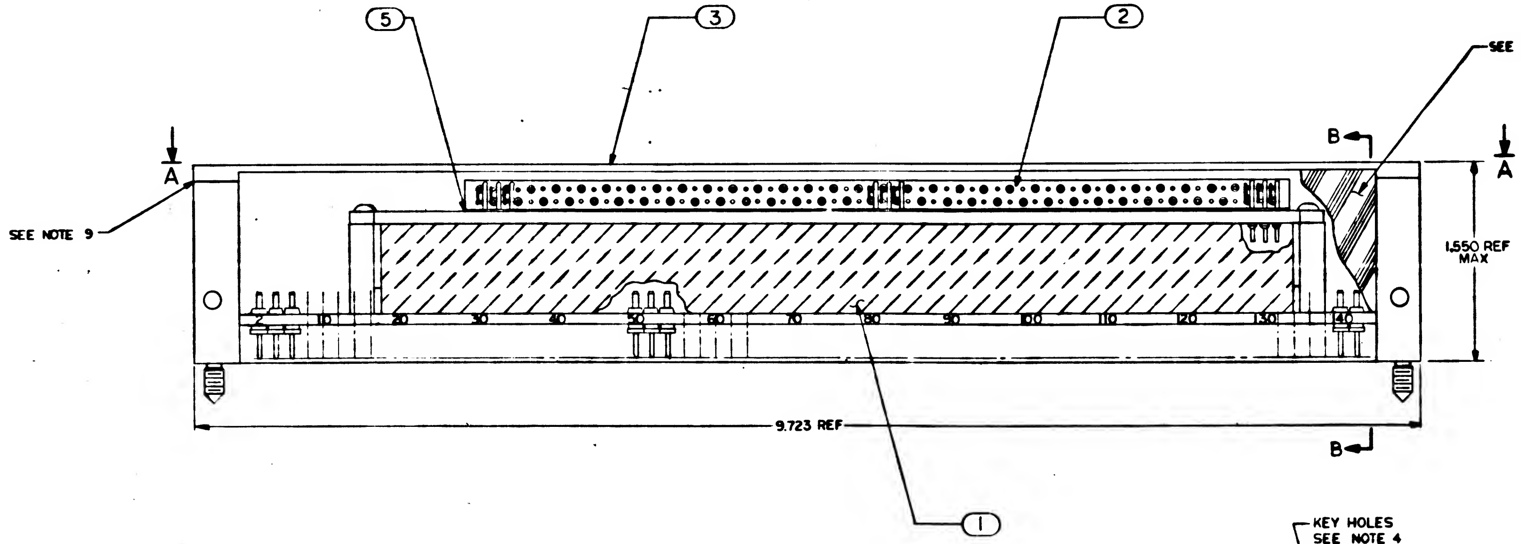
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

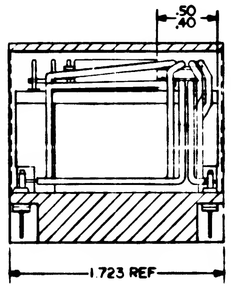
REVISIONS

SYM	DESCRIPTION B 00436	DATE	APPROVAL
A	CHANGED PER TDRR 01190	5-8-63	
B	REVISED AND UPGRADED FOR CLASS A RELEASE 01822	7/2/63	
C	REVISED PER TDRR 02703		
D	REVISED PER TDRR 03644		WR
E	REVISED PER TDRR 04321		WK
F	REVISED PER TDRR 04610	11-13-63	WK
G	REVISED PER TDRR 04728	11-19-63	
H	REVISED PER TDRR 05637		
J	REVISED PER TDRR 08404 DR CHK RSE	8/11/64	
K	REVISED PER TDRR 11243 DR CHK RTM	9/14/64	
L	REVISED PER TDRR 12314 DR CHK RTM	9/24/64	

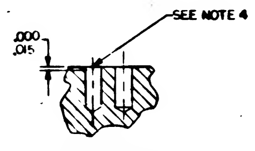




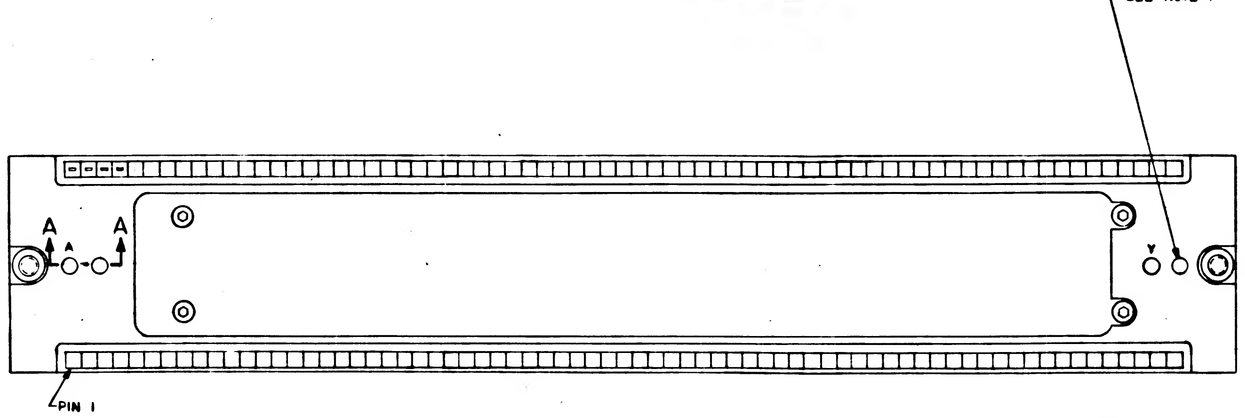


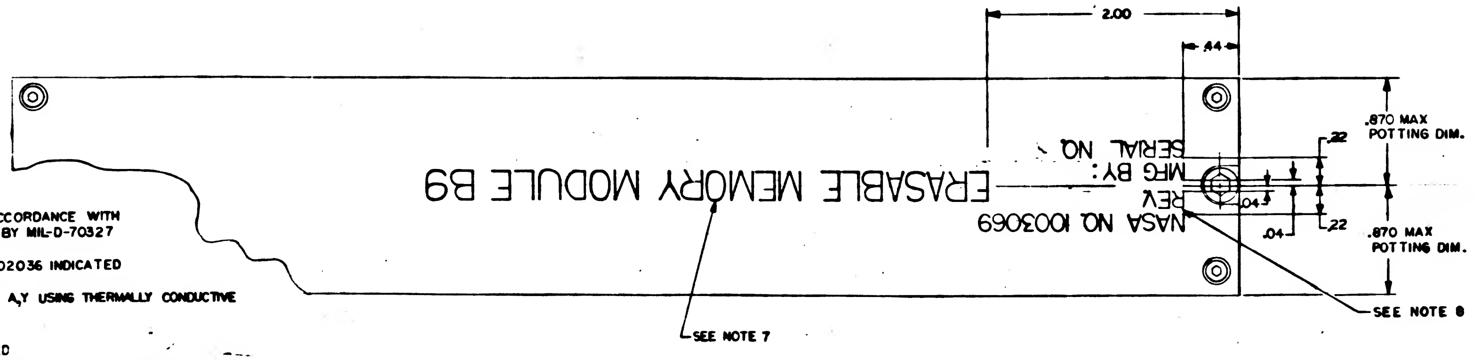


SECTION B-B



SECTION A-A





VIEW A A

NOTES:—
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005
3. ENCAPSULATE PER ND1002036 INDICATED AREA ONLY
4. FILL KEYING HOLES MARKED A,Y USING THERMALLY CONDUCTIVE RESIN PER ND 1002183
6. A R DENOTES AS REQUIRED
7. MARK .250 HIGH WHITE PER ND1002019 LOCATE AS SHOWN
8. MARK .093 HIGH WHITE PER ND1002019 LOCATE AS SHOWN
9. APPLY FIND NO.13 TO INTERFACE PRIOR TO ASSY

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
X	1006061	SCHEMATIC	REF
AR	1006879	SILCONE COMPOUND THERMOCONDUCTIVE	13
2	1004546-1	WASHER, FLAT	12
2	MS 16633-4015	RING RETAINING EXTERNAL "E"	11
~~2~~	~~1004117~~	~~PLUG, KEYING~~	~~10~~
~~2~~	~~1004207~~	~~DRIVE CYLINDER EJECTION SCREW~~	9
2	1004546-3	WASHER, FLAT	8
~~2~~	~~MS 39086-108~~	~~PIN SPRING SPIRAL~~	~~7~~
2	1004579-1	SCREW, JACKING	6
AR	1006806-3	6 1/2 X .600 WIDE DOUBLE SIDED TAPE	5
4	1006273-11	SCREW, CAP, BUTTON HEAD	4
1	1004190	COVER, ERASABLE MEMORY MODULE	3
1	1003070	DIODE BLOCK ASSEM	2
1	1003068	ERASABLE MEMORY CORE STACK, ASSY	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003184	1003186

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 .02 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
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DWG. NO. CONTRACT
DRAWN DATE 2/13/62
CHECKED 12/11/62
APPROVAL 2/19/63
APPROVAL 2/18/63
NASA APPROVAL 2/20/63
MIT APPROVAL

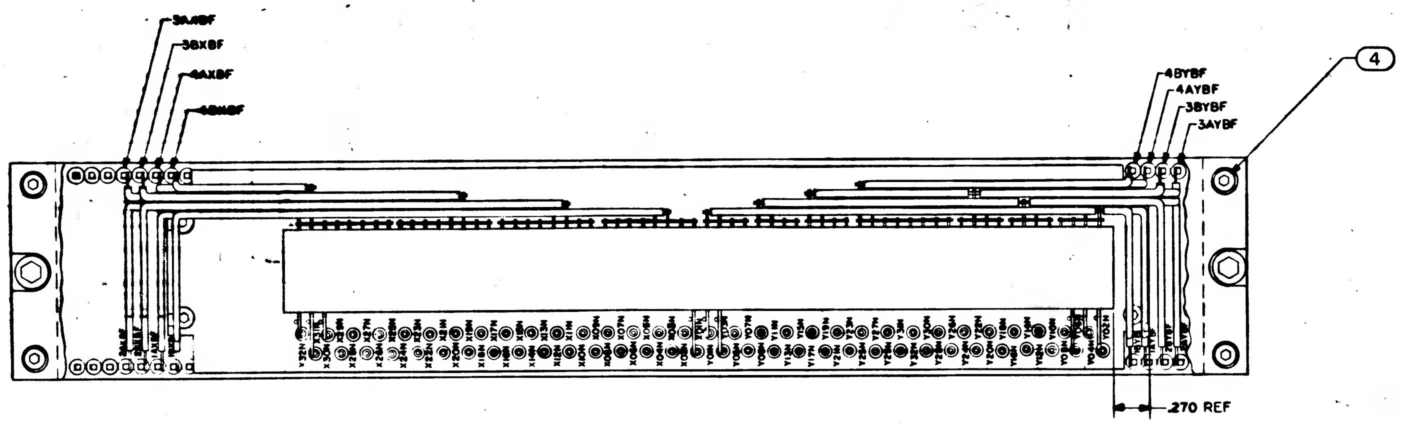
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

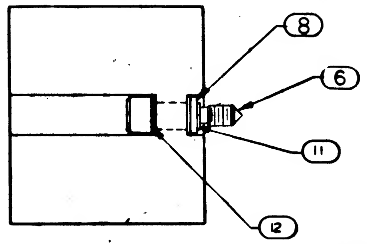
ERASABLE MEMORY
MODULE B9
ASSEMBLY

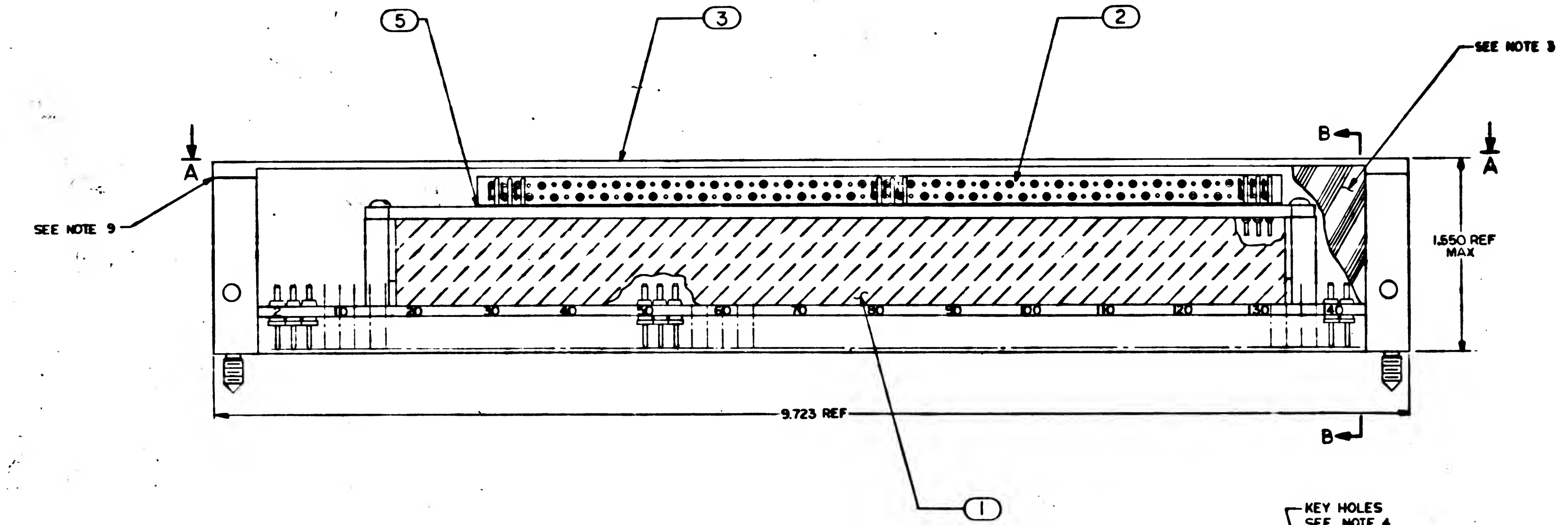
CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003069
SCALE 2/1
WT —
SHEET 1 OF 1

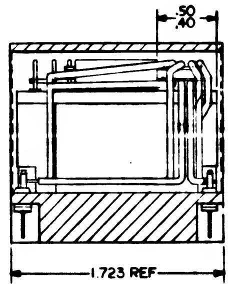
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	CHANGED PER TDRR 01190	5-8-63	WK
B	REVISED AND UPGRADED FOR CLASS A RELEASE 01882	[illegible]	[illegible]
C	REVISED PER TDRR 02703	[illegible]	[illegible]
D	REVISED PER TDRR 03644	[illegible]	WR
E	REVISED PER TDRR 04321	10-30-63	WK
F	REVISED PER TDRR 04610	11-13-63	WR
G	REVISED PER TDRR 04728	11-19-63	[illegible]
H	REVISED PER TDRR 05637	[illegible]	[illegible]
J	REVISED PER TDRR 08404 DR CHK R.R.E. RS	5/11/64	[illegible]
K	REVISED PER TDRR 11243 DR CHK RTM	9/14/64	[illegible]
L	REVISED PER TDRR 12314 DR CHK RTM	9/28/64	[illegible]
M	REVISED PER TDRR 13080 DR CHK RTM	10/12/64	[illegible]

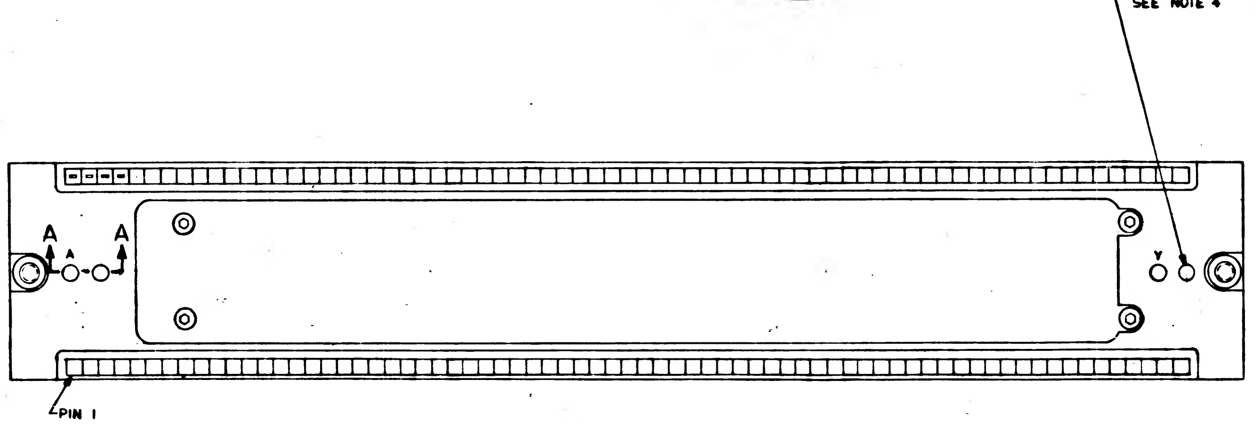


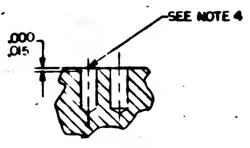






SECTION B-B





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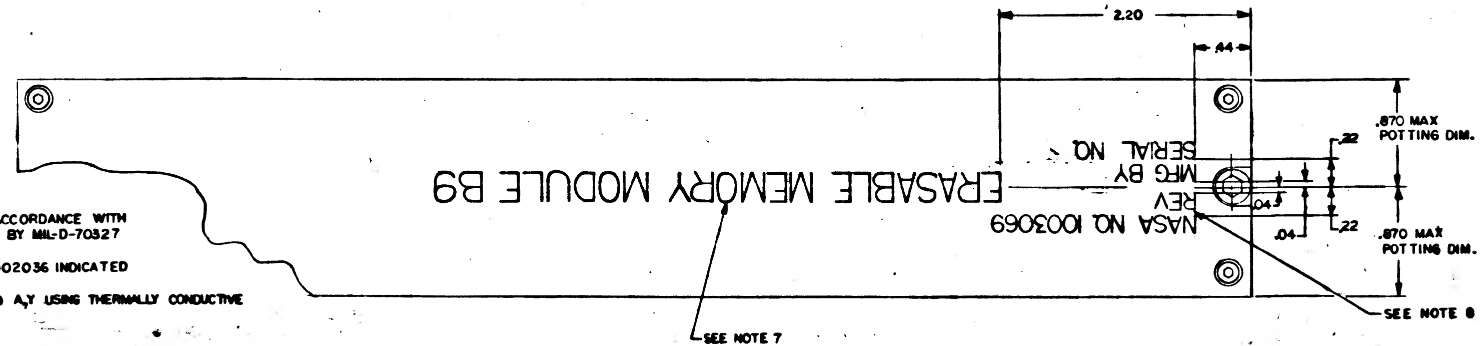


VIEW A A

NOTES:—

INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005
3. ENCAPSULATE PER ND1002036 INDICATED AREA ONLY
4. FILL KEYING HOLES MARKED A,Y USING THERMALLY CONDUCTIVE RESIN PER ND 1002183

6. A R DENOTES AS REQUIRED
7. MARK .250 HIGH WHITE PER ND1002019 AND ND1002122 TYPE II CLASS 1
8. MARK .093 HIGH WHITE PER ND1002019 AND ND1002122 TYPE II CLASS 2, SERIALIZE PER ND1002023
9. APPLY FIND NO.13 TO INTERFACE PRIOR TO ASSY

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
X	1006061	SCHEMATIC	REF
AR	1006879	SILCONE COMPOUND THERMOCONDUCTIVE	13
2	1004546-1	WASHER, FLAT	12
2	MS 16633-4015	RING RETAINING EXTERNAL "E"	11
~~2~~	~~1004117~~	~~PLUG, KEYING~~	~~10~~
~~2~~	~~1004207~~	~~DRIVE CYLINDER EJECTOR SCREW~~	~~9~~
2	1004546-3	WASHER, FLAT	8
~~2~~	~~MS 39086-100~~	~~PIN SPRING SPIRAL~~	~~7~~
2	1004579-1	SCREW, JACKING	6
AR	1006806-3	6 1/2 X .600 WIDE DOUBLE SIDED TAPE	5
4	1006273-11	SCREW, CAP, BUTTON HD	4
1	1004190	COVER, ERASABLE MEMORY MODULE	3
1	1003070	DIODE BLOCK ASSEMBLY	2
1	1003068	ERASABLE MEMORY CORE STACK, ASSY	1

LIST OF MATERIALS

1003184	1003186
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.005 .02 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

M I T
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO CONTRACT
DRAWN DATE [illegible]
CHECKED 12/?/62
APPROVAL 2/19/63
APPROVAL 2/?/63
NASA APPROVAL 2/20/63
MIT APPROVAL

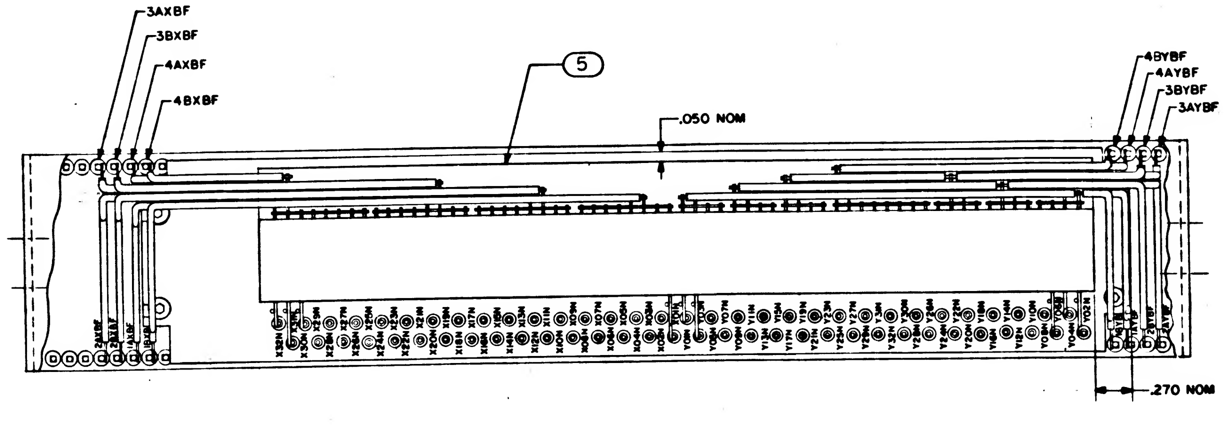
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

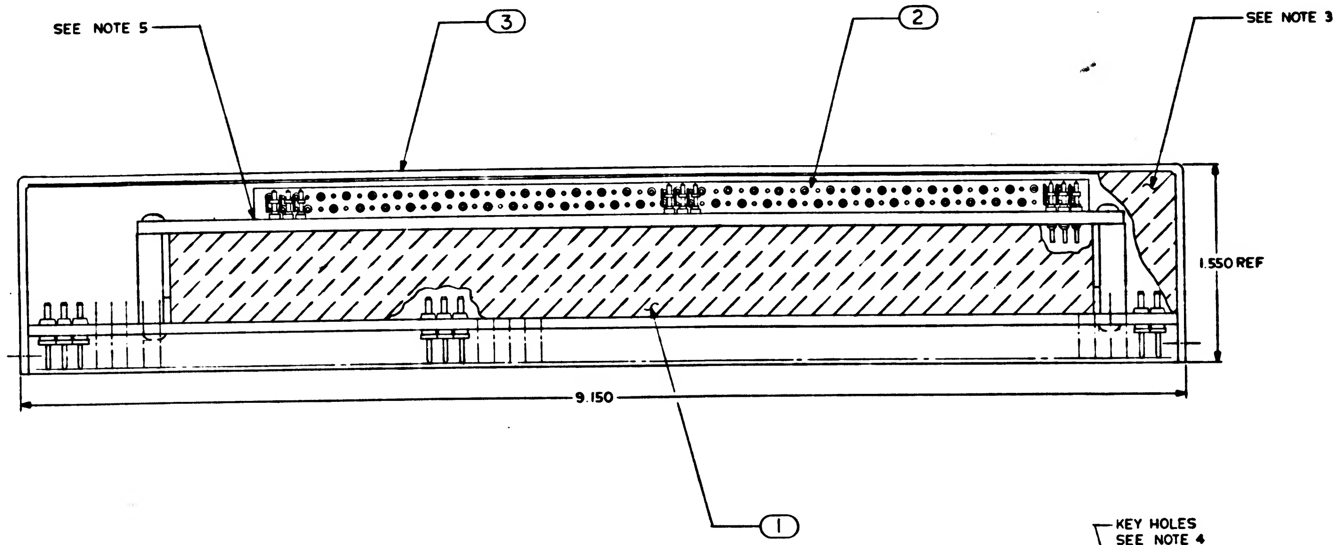
ERASABLE MEMORY MODULE B9 ASSEMBLY

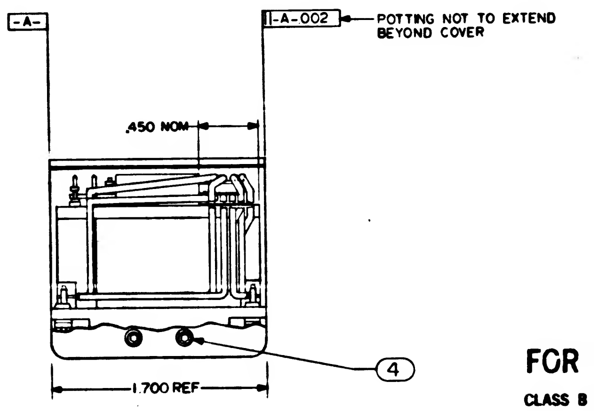
CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003069
SCALE 2/1
WT —
SHEET 1 OF 1

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

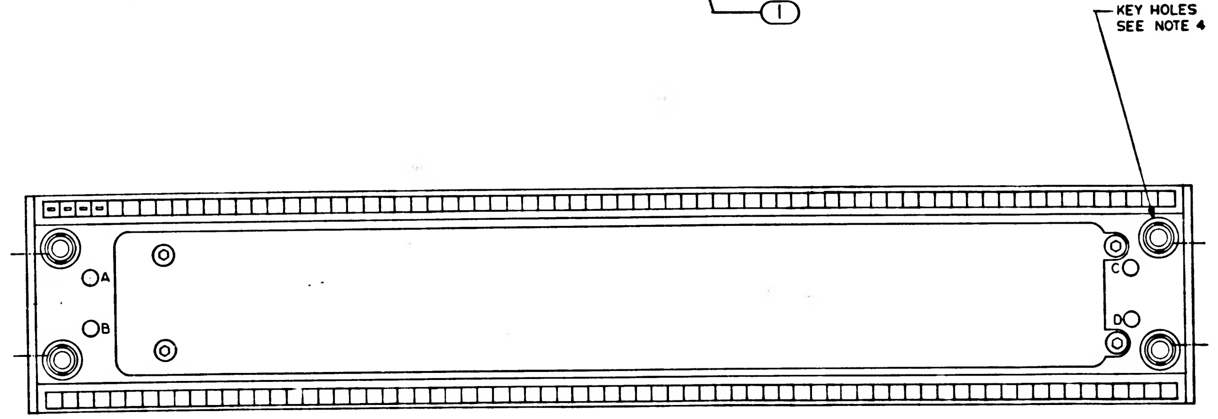






FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00436 DATE 2-20-63



NOTES:—
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005
3. ENCAPSULATE WITH POLYURETHANE FOAM PER ND 1002002 (BLACK)
4. PLUG KEY POSITIONS INDICATED IN CHART PER ND
5. CEMENT FIND NO. 2 AND FIND NO. 5 TO FIND NO. 1 PER ND 1002004

A	B	C	D
KEY POSITIONS			

SEE NOTE 4

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	1004081-3	INSULATOR, MYLAR	5
4	1006783-9	2-56 UNC BUTTON HD SOCKET SCREW	4
1	1003058-1	COVER & INSULATOR ASSEMBLY	3
1	1003070	DIODE BLOCK ASSEMBLY	2
1	1003068	ERASABLE MEMORY CORE STACK, ASSY	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± —
DECIMALS ±.005
ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

M I T
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO
CONTRACT
DRAWN DATE 2/13/62
CHECKED 12/3/62
APPROVAL W.K. 2/19/63
APPROVAL 2/18/63
NASA APPROVAL Jack 2/20/63
MIT APPROVAL 2/20/63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

ERASABLE MEMORY STICK ASSEMBLY

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003069
SCALE 2/1
WT —
SHEET 1 OF 1

1003069

APOLLO G&N Specification
PS 1003069
Original Issue Date: 2/17/65
Release Authority: TDRR 16537
Class A Release

PROCUREMENT SPECIFICATION
FOR
ERASABLE MEMORY MODULE

Record of Revisions

Date	Revision Letter	TDRR No.	Pages Revised	Approvals	
				MIT	NASA

This specification consists of pages 1 to 8 inclusive.

APPROVALS	2/17/65 NASA/MSC	E C Hall 2/12/65	17 Feb 65 MIT/IL	2/3/65 2/5/65 Bill MacMunn 1/20/65 RAY 2-4-65

3-3.1 Functional Requirements. The module shall meet the following requirements under the conditions as specified below.

3-3.1.1 Input Current Pulses. The X and Y lines input current pulses shall be driven in a current coincidence mode by pulses with the following characteristics. See Figure 1.

Amplitude	295 ma ± 10%
Rise Time (TR)	0.30 ± 0.15 usec
Fall Time (TF)	0.30 ± 0.15 usec
Pulse Width (PW)	2.0 ± 0.5 usec.

3-3.1.1.1 The Z lines shall be driven by a current pulse with the following characteristics, see Figure 1.

Amplitude	295 ma ± 10%
Rise Time (TR)	0.30 ± 0.15 usec
Fall Time (TF)	0.30 ± 0.15 usec
Pulse Width (PW)	3.5 ± 0.4 usec

3-3.1.2 Output Bit Characteristics. The module shall be exercised by cycling throughout the memory, a simulated worst word in the form of a double checkerboard pattern and its complement. Each output bit shall be examined for the following characteristics, see Figure 2.

Minimum ONE (V_1)	42 mv
Maximum ZERO (V_0)	18 mv
Time to Peak (T_p)	0.40 to 0.64 usec
Time to Switch-off (Tsw)	0.96 to 1.36 usec

3-3.2 Environmental Requirements. The module shall be operated in accordance with the requirements specified in sections 3-3.1.1 thru 3-3.1.2 when the ambient temperatures are 0° ± 2°C and 65° ± 2°C. Operation of the Erasable Memory Module under the temperature extremes specified herein is for verification of good workmanship. Only intermittent test results, shorts, or open circuits shall indicate a malfunction within the module.

3-3.3 Service Life. The module design is intended to meet the following requirements.

3-3.3.1 Operating Life. The module is intended to meet performance specifications for at least 2000 hours of operation, excluding the contractor's test time of the complete unit.

3-3.3.2 Shelf Life. The module is intended to have a shelf life of at least 3 years, without operation, at ambient room temperature after final acceptance at the contractor's plant when packaged in accordance with ND 1002214.

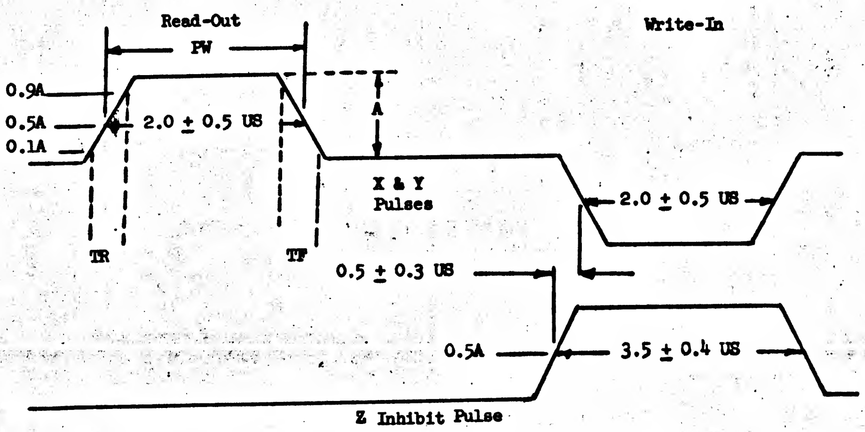


FIGURE 1. Input Waveform Characteristics.

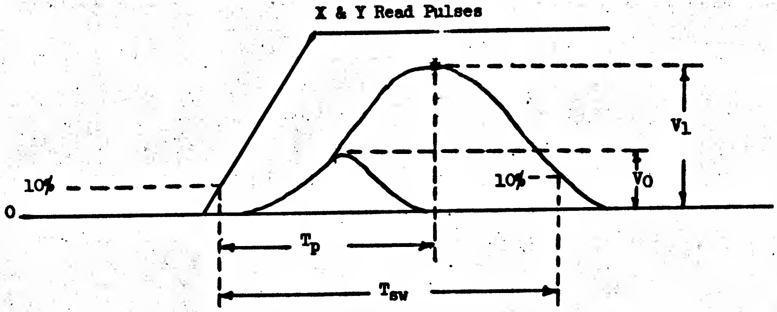


FIGURE 2. Output Waveform Characteristics.

3-3.4 Design Characteristics

3-3.4.1 Interchangeability. Unless otherwise specified, the module shall be physically and functionally interchangeable without selection or fitting.

3-3.4.2 Reliability. The module shall be capable of meeting a maximum failure rate of 2.92 failures per million hours at a 90 percent confidence level.

4. QUALITY ASSURANCE PROVISIONS

4-1 GENERAL. Unless otherwise specified herein, the contractor is responsible for the performance of all inspection requirements prior to submission for NASA inspection and acceptance. Except as otherwise specified, the contractor may utilize his own facilities or any commercial laboratory acceptable to NASA. Inspection records of the examinations and tests shall be kept complete and available to NASA as specified in the contract or order.

4-1.1 Acceptance Tests. These tests shall be accomplished on each module being submitted for acceptance under the contract. Acceptance test data on each unit accepted must accompany shipment to the procuring activity. Acceptance tests shall be witnessed by the cognizant government inspector, a representative of the procuring activity, or as the procuring activity may direct in the procurement order. These tests are detailed in paragraph 4-2. Failure of the module to comply with these requirements shall result in rejection of the item or lot of items.

4-1.1.1 NASA Acceptance Inspection. The NASA acceptance inspection will be in accordance with FTM 1003069 for the Erasable Memory Module.

4-1.2 Qualification and Requalification Tests. Qualification and Requalification tests shall be at a NASA-designated activity in accordance with NASA Document NPC 200-2, Quality Program Provisions for Space System Contractors, and such other documents as may be provided. These tests, as outlined in paragraph 4-3, shall be conducted after the award of the contract to determine that the product will meet all specified requirements.

Failure of the Module to comply with these requirements shall result in the rejection of the lot or the cessation of production, as determined by the procuring activity.

4-2 ACCEPTANCE TESTS.

4-2.1 Test Conditions. Unless otherwise specified herein, the module shall be subjected to tests under the following ambient conditions:

Temperature	25 ± 10°C
Relative Humidity	Not more than 90%
Barometric Pressure	28 to 32 in Hg.

4-2.2 Tests. The module shall be tested for the requirements as described in sections 3-3.1 and 3-3.2.

4-2.3 Visual and Mechanical Inspection. A comprehensive inspection shall be made of the module to determine the extent of compliance with the requirements of this specification and the applicable NASA drawing 1003069 and shall at least include determination of the following:

1. Size, dimension, weight, appearance, and markings
2. Finish, coatings, construction, markings, as applicable
3. Welding, soldering, and terminals, as applicable
4. Workmanship and cleanup

4-3 QUALIFICATION AND REQUALIFICATION TEST. Qualification and Requalification tests may be performed individually or when the module is assembled as part of the APOLLO Guidance Computer Subsystem. The tests shall be in accordance with the applicable paragraphs of specification ND-1002037 as directed by the procuring activity.

5. PREPARATION FOR DELIVERY

5-1 GENERAL. Unless otherwise specified by the procuring activity or the applicable detail specification, the assemblies shall be preserved, packaged, packed and marked in accordance with Specification ND 1002214.

6. NOTES

6-1 INTENDED USE. The Erasable Memory Module is intended for use in the APOLLO Guidance Computer.

NOTICE: When NASA drawings, specifications, or other data are used for any purpose other than in connection with a definitely related NASA procurement operation, the National Aeronautics and Space Administration thereby incures no responsibility nor any obligation whatsoever; and the fact that NASA may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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REVISIONS - ECR 00436			
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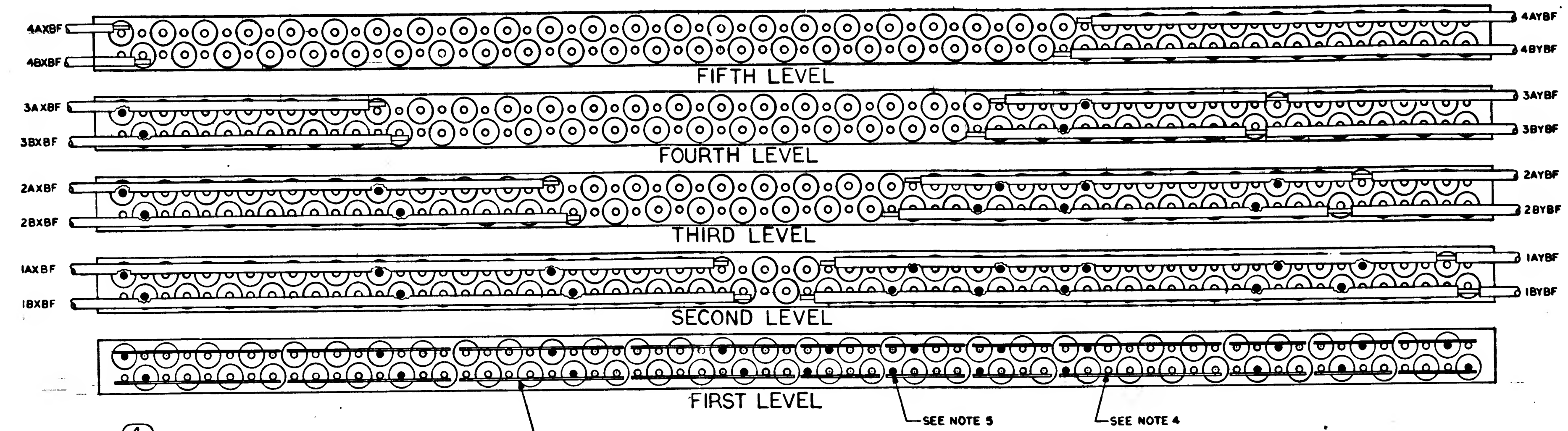
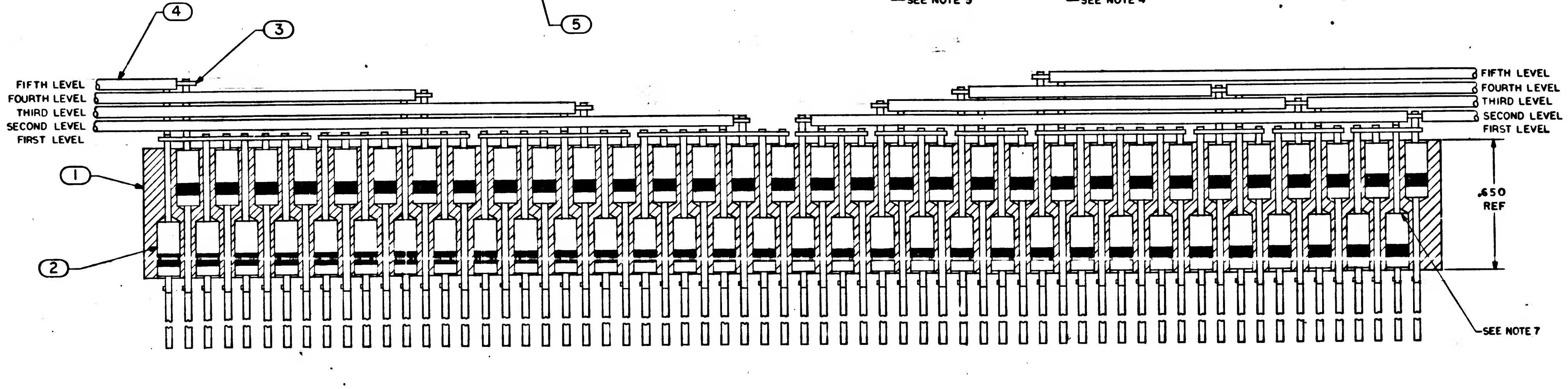
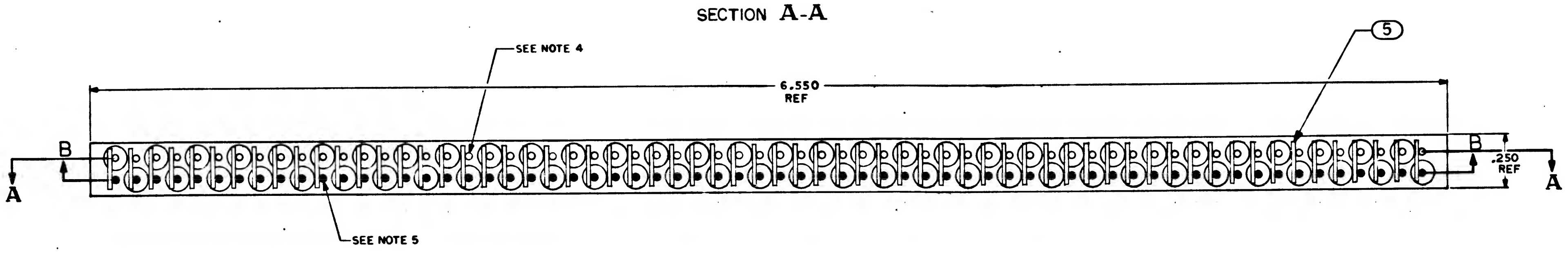
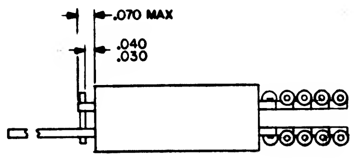
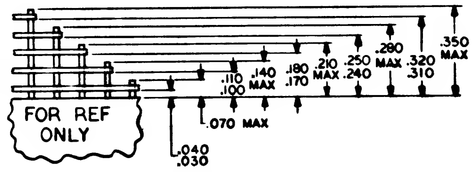




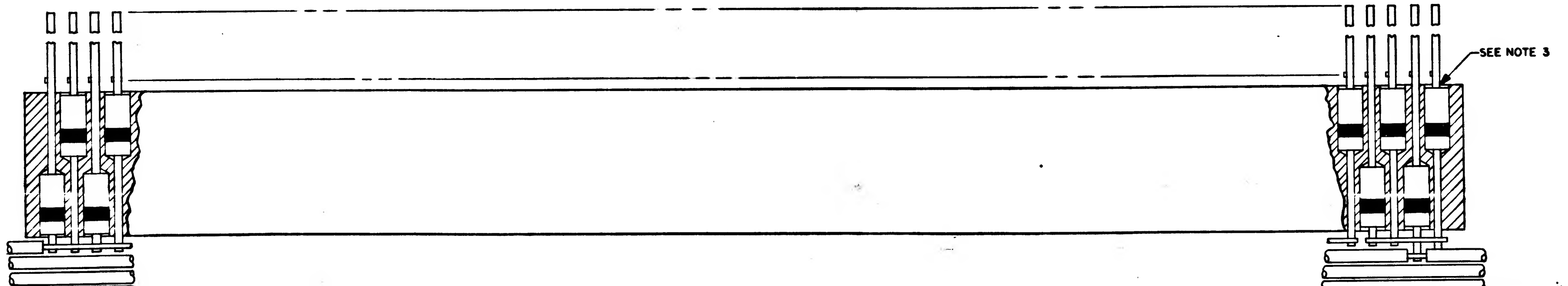
SECTION A-A







TYPICAL VIEW SHOWING WIRING
HEIGHT DIMENSIONS



SECTION B-B

MASTER

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND1002005
3. POLARITY OF DIODES IN THIS VIEW TYPICAL
4. ○WHITE DOT DENOTES LEAD TO BE CUT AT LEVEL INDICATED
5. ●BLACK DOT DENOTES LEAD TO BE LEFT LONG
6. A.R. DENOTES AS REQUIRED
7. STAKE PER ND1002009

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
A.R.	1006757-1	.010 X .020 WIRE	5
A.R.	1006776 - 21	INSULATION SLEEVING	4
A.R.	1006757-8	.020 WIRE, ELECTRICAL	3
128	1006751	DIODE, SILICON RECTIFIER	2
1	1004088	DIODE BLOCK	1

LIST OF MATERIALS

1003069	
NEXT ASSY	USED ON
APPLICATION	

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MIT APPROVAL 20 Feb 63

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DIODE BLOCK ASSEMBLY
ERASABLE MEMORY STICK

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003070
SCALE 4/1
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1003070

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REVISIONS TDRR 00436			
SYM	DESCRIPTION	DATE	APPROVAL
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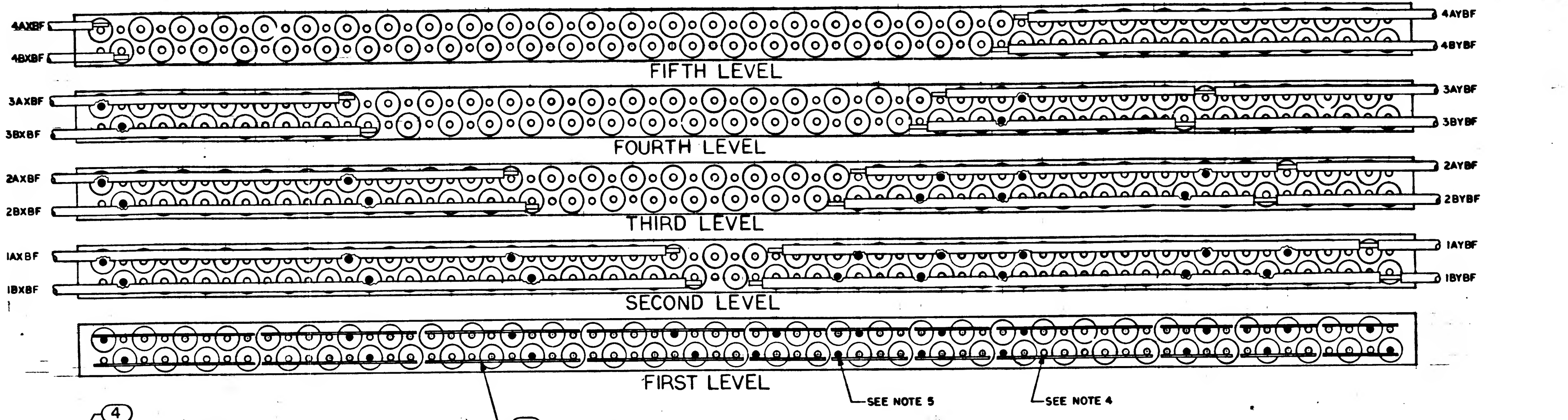
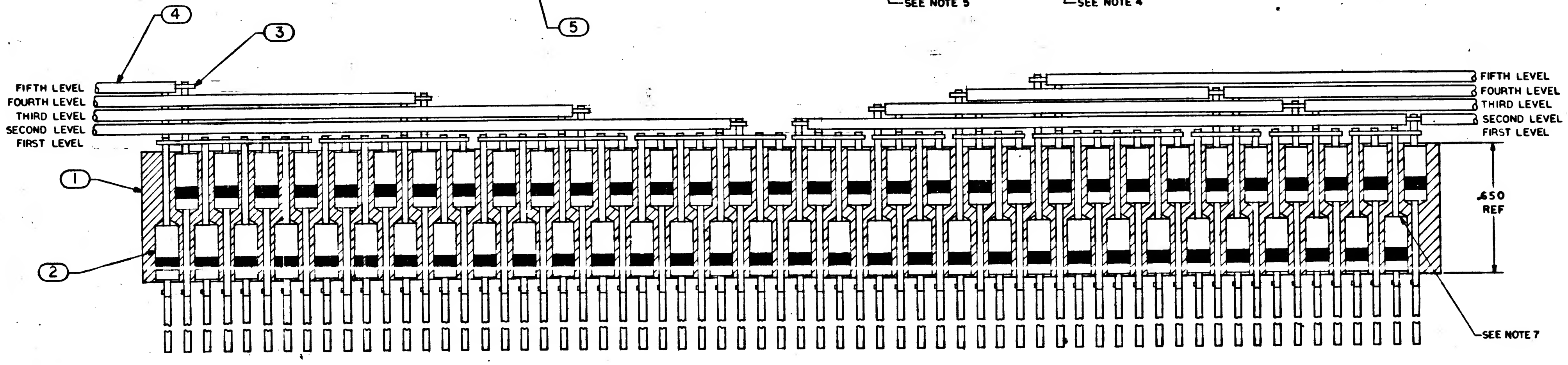
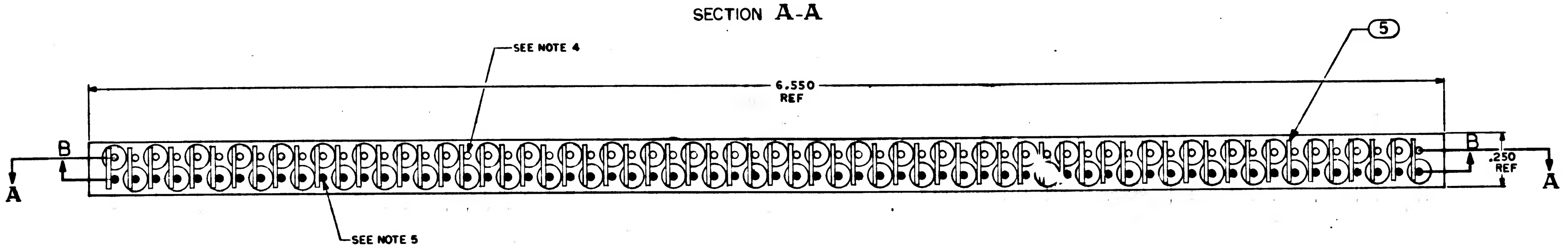
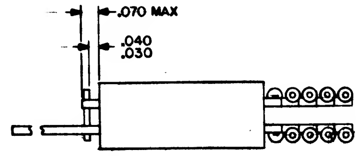
B	REVISED PER TDRR 03643	10-3-63	

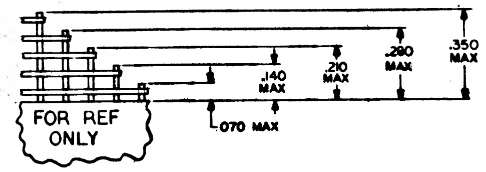




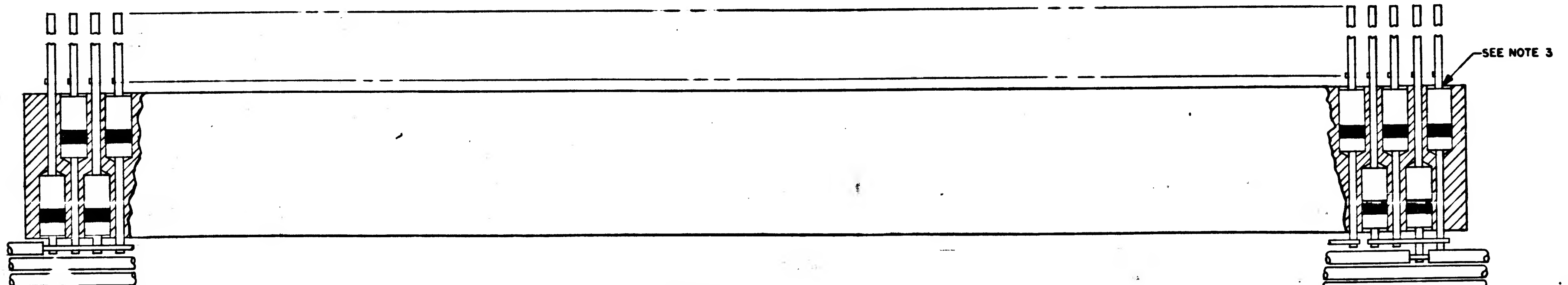
SECTION A-A







TYPICAL VIEW SHOWING WIRING HEIGHT DIMENSIONS



SECTION B-B

MASTER

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND1002005
3. POLARITY OF DIODES IN THIS VIEW TYPICAL
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5. ●BLACK DOT DENOTES LEAD TO BE LEFT LONG
6. A.R. DENOTES AS REQUIRED

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
A.R.	1006757-1	.010 X .020 WIRE	5
A.R.	1006776 - 21	INSULATION SLEEVING	4
A.R.	1006757-8	.020 WIRE, ELECTRICAL	3
128	1006751	DIODE, SILICON RECTIFIER	2
1	1004088	DIODE BLOCK	1

LIST OF MATERIALS

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1003069	

APPLICATION

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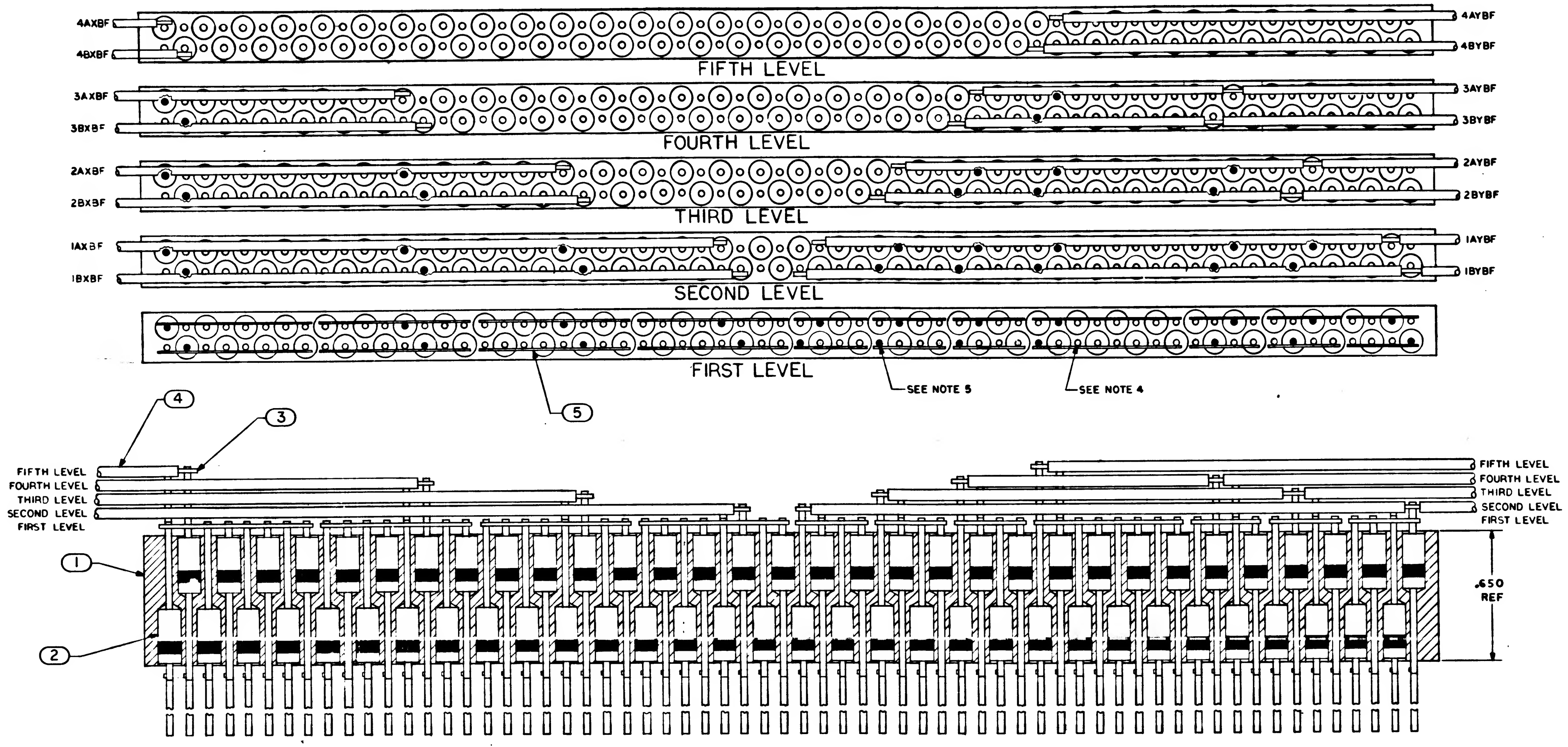
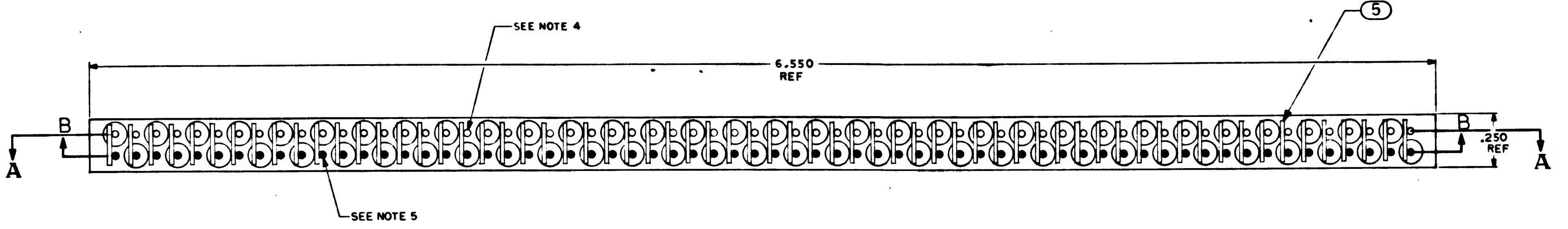
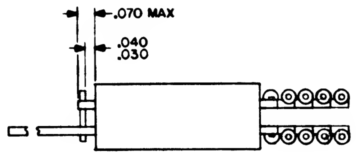
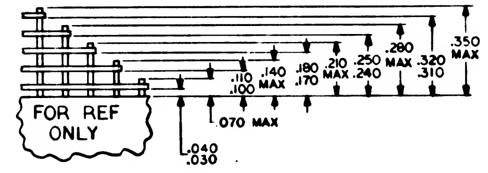


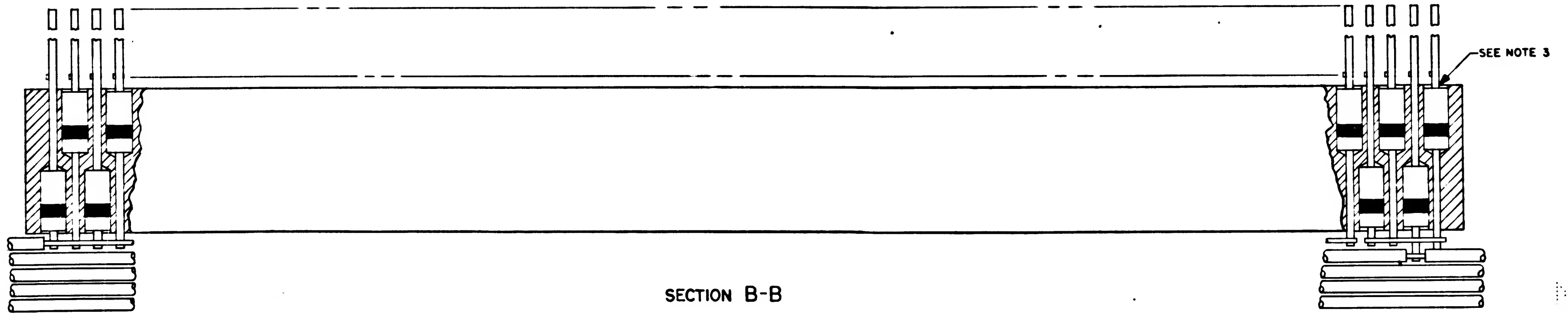
SECTION A-A







TYPICAL VIEW SHOWING WIRING HEIGHT DIMENSIONS



SECTION B-B

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CLASS B RELEASE TDR No. 00436 DATE 2-20-63

NOTES:
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6. A.R. DENOTES AS REQUIRED

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
A.R.	1006757-1	.010 X .020 WIRE	5
A.R.	1006776 - 22	INSULATION SLEEVING	4
A.R.		.020 WIRE, ELECTRICAL	3
128	1006751	DIODE, SILICON RECTIFIER	2
1	1004088	DIODE BLOCK	1

LIST OF MATERIALS

1003069	
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NASA APPROVAL Jack Garman 2/20/63
MIT APPROVAL 20 Feb 63

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ERASABLE MEMORY STICK

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SCALE 4/1
WT
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1003070

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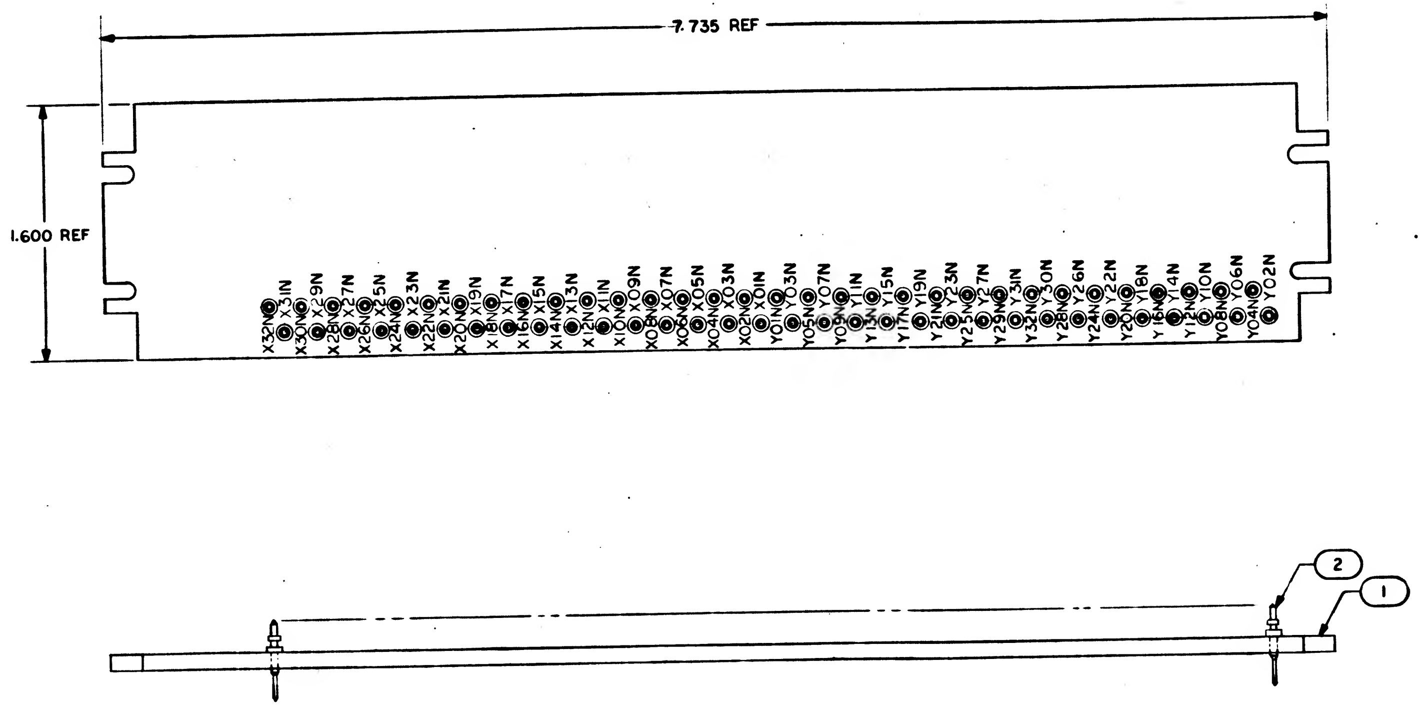

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CLASS B RELEASE TDR No. 00309 DATE 30 Jan 1963

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ASSEMBLE FIND NO.2 AND FIND NO.1 AS SHOWN
3. SILK SCREEN WHITE CHARACTERS AS SHOWN PER MIL-STD-130 REF SILK SCREEN MASTER DWG NO. 1004093

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
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LIST OF MATERIALS

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1003068	

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APPROVAL W. Turner 28 Jan 63
APPROVAL D. Hoag 28 Jan 63
NASA APPROVAL W. J. [illegible] 2-20-63
MIT APPROVAL W. Ragan 30 Jan 63

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SIZE D
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1003071 A

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REVISIONS			
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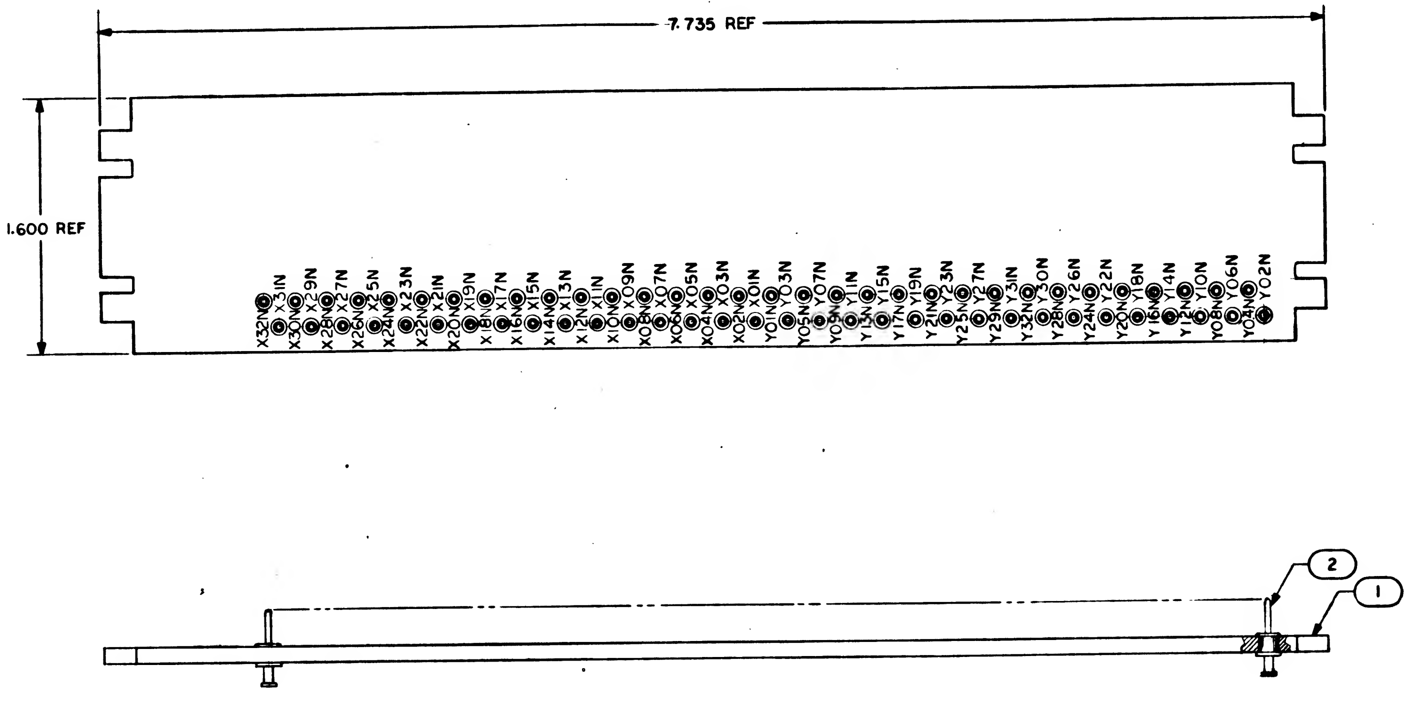
B	REVISED PER TDRR 01120	1 MAY 63	WK



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CLASS B RELEASE TDR No. 00309 DATE 30 Jan 1963

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ASSEMBLE FIND NO. 2 AND FIND NO. 1 AS SHOWN
3. SILK SCREEN WHITE CHARACTERS AS SHOWN PER MIL-STD-130 REF SILK SCREEN MASTER DWG NO. 1004093

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1	1004090	FEED THRU TERMINAL PLATE	1

LIST OF MATERIALS

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APPROVAL 28 Jan 63
NASA APPROVAL W. J. 3-20-63
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REVISIONS TDRR 00309

SYM	DESCRIPTION	DATE	APPROVAL
A	CHANGED PER TDRR N00533	2-28-63	WK
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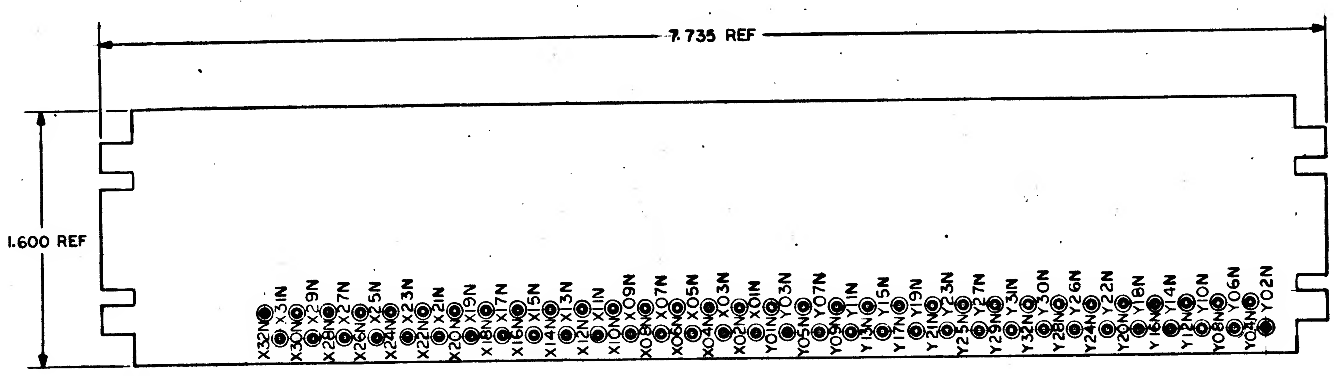

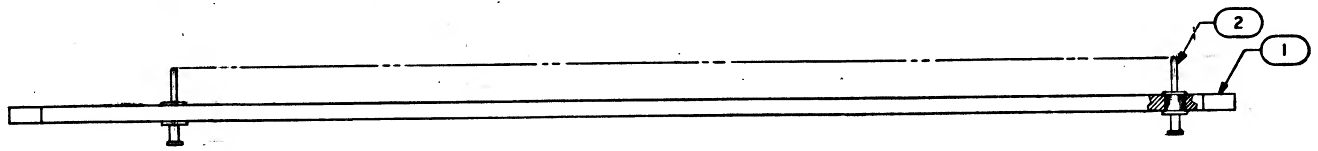

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1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ASSEMBLE FIND NO. 2 AND FIND NO. 1 AS SHOWN
3. SILK SCREEN WHITE CHARACTERS AS SHOWN PER MIL-STD-130 REF SILK SCREEN MASTER DWG NO. 1004093

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
64	1006830	FEED THRU	2
1	1004090	FEED THRU TERMINAL PLATE	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003068	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO.
CONTRACT
DRAWN J. Conley DATE 12-17-62
CHECKED 12/21/62
APPROVAL W. E. Turner 28 JAN 63
APPROVAL 28 Jan 63
NASA APPROVAL 9-30-63
MIT APPROVAL 30 Jan 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

FEED THRU PLATE ASSEMBLY

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003071
SCALE 2/1
WT
SHEET 1 OF 1

1003071

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

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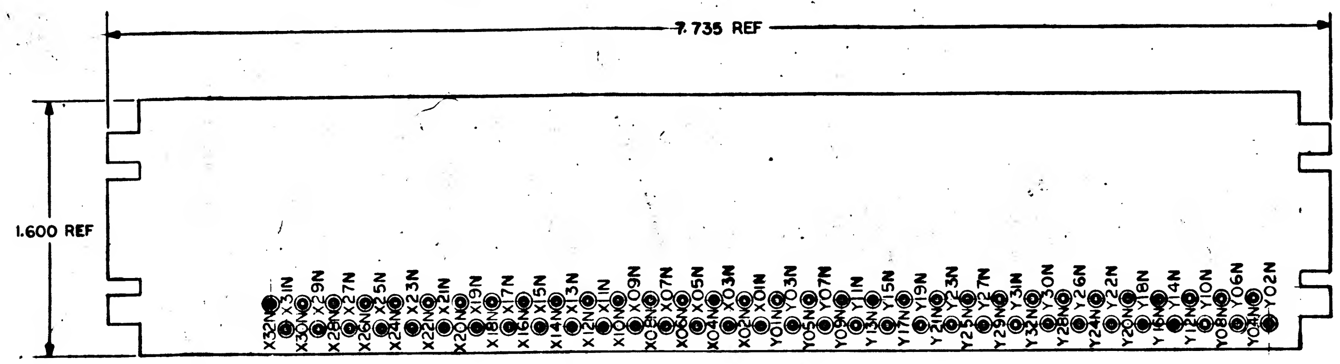
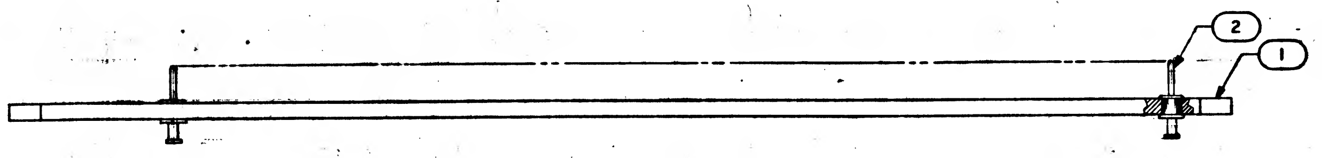
REVISIONS TDR [illegible]

SYM	DESCRIPTION	DATE	APPROVAL
A	CHANGED PER TDRR 00052	12-2-63	
B	REVISED PER TDRR 01120	1 MAY 63	
C	UPGRADED FROM CLASS B TO CLASS A PER TDRR 01824	28 JUNE 63	
D	REVISED PER TDRR 05643	7-[illegible]-64	





NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ASSEMBLE FIND NO.2 AND FIND NO.1 AS SHOWN
3. SILK SCREEN WHITE CHARACTERS AS SHOWN PER MIL-STD-130 REF SILK SCREEN MASTER DWG NO. 1004093

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
64	1006830-2	FEED THRU	2
1	1004090	FEED THRU TERMINAL PLATE	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003068	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO.
CONTRACT
DRAWN DATE 12-17-62
CHECKED 12/31/62
APPROVAL 28 JAN 63
APPROVAL
NASA APPROVAL
MIT APPROVAL 31 Jan 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

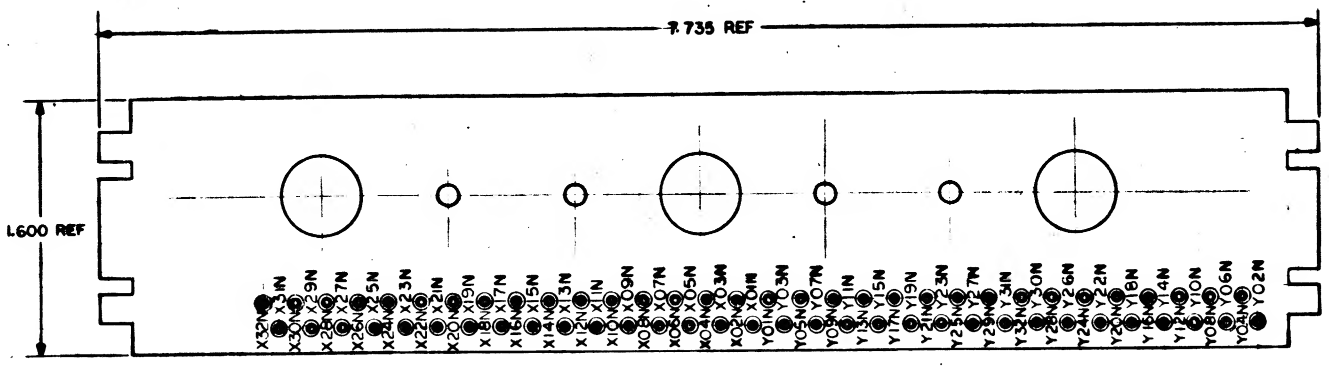
FEED THRU PLATE
ASSEMBLY

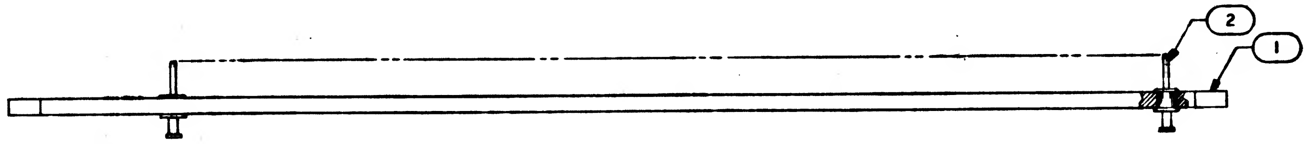
CODE IDENT NO. —
SIZE D
NASA DRAWING NO. 1003071
SCALE 2/1
WT
SHEET 1 OF 1

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS TDRR 00309

SYM	DESCRIPTION	DATE	APPROVAL
A	CHANGED PER TDRR 00053	2-28-63	
B	REVISED PER TDRR 01180	1 MAY 63	
C	UPGRADED FROM CLASS B TO CLASS A PER TDRR 01824	28 JUNE 63 7/	
D	REVISED PER TDRR 05643	7 JAN 64	
E	REVISED PER TDRR 11310 DR S.A. Clermont CHK RTM	8/13/64	HVC





NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ASSEMBLE FIND NO. 2 AND FIND NO. 1 AS SHOWN
3. SILK SCREEN WHITE CHARACTERS AS SHOWN PER MIL-STD-130 REF SILK SCREEN MASTER DWG NO. 1004093

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
64	1006830-2	FEED THRU	2
1	1004090	FEED THRU TERMINAL PLATE	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003068	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS.

DRAWN DATE 12-17-62
CHECKED
APPROVAL 28 JAN 63
APPROVAL
NASA APPROVAL
MIT APPROVAL 31 Jan 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

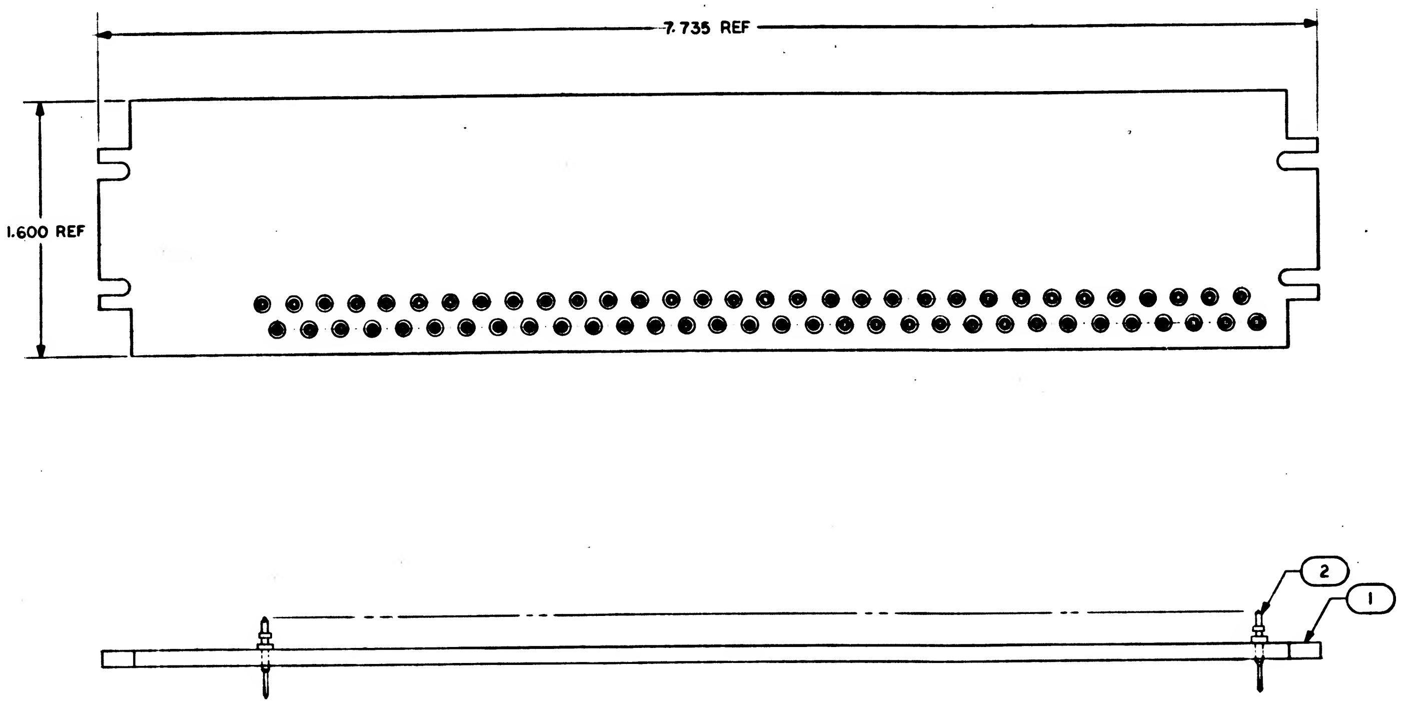
FEED THRU PLATE ASSEMBLY

CODE IDENT NO. —
SIZE D
NASA DRAWING NO. 1003071
SCALE 2/1
WT
SHEET 1 OF 1

1003071

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00309 **DATE** 30 Jan 1963

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. ASSEMBLE FIND NO. 2 AND FIND NO. 1 AS SHOWN

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
64	1004087	FEED THRU REWORKED	2
1	1004090	FEED THRU TERMINAL PLATE	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN J. Cowley DATE 12-17-62
CHECKED 12/21/62
APPROVAL 28 JAN 63
APPROVAL 28 Jan 63
NASA APPROVAL W. J. 9-30-63
MIT APPROVAL 30 Jan 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

FEED THRU PLATE ASSEMBLY

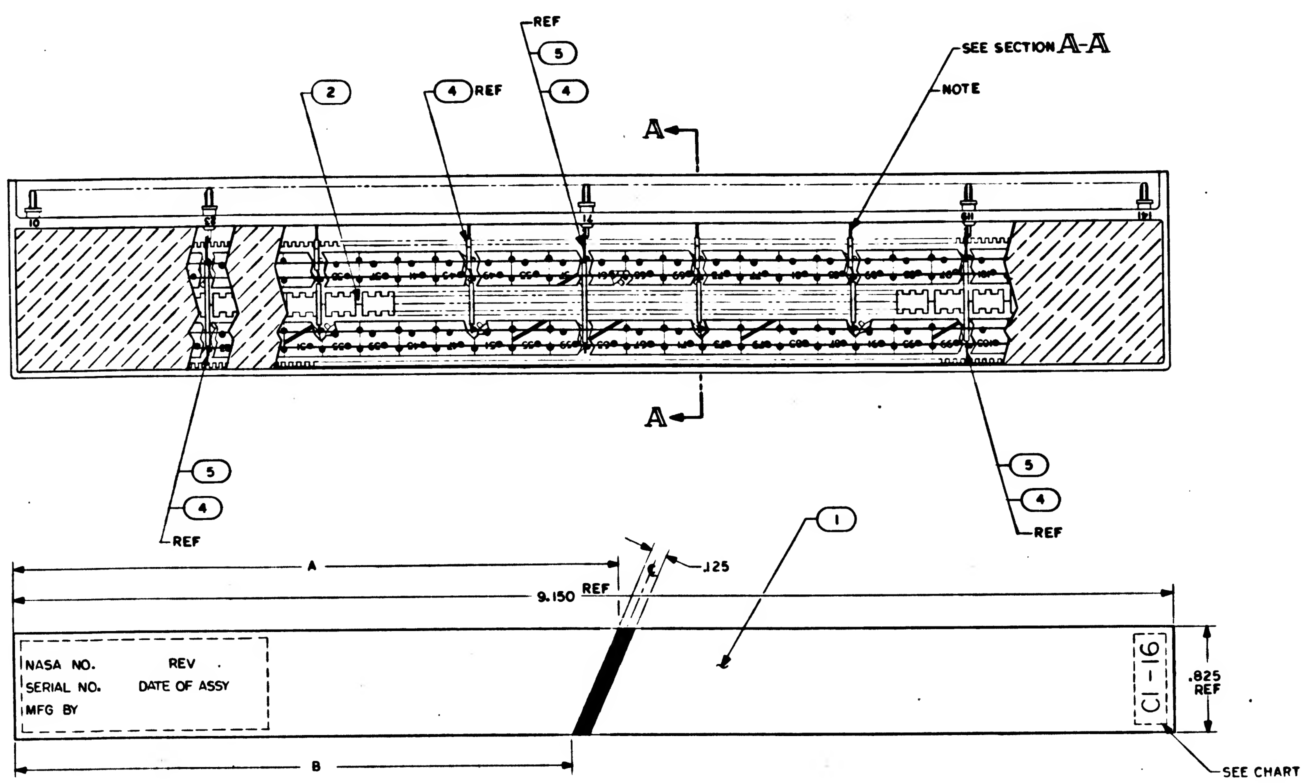
CODE IDENT NO.	SIZE	NASA DRAWING NO.
	D	1003071
SCALE 2/1	WT	SHEET 1 OF 1

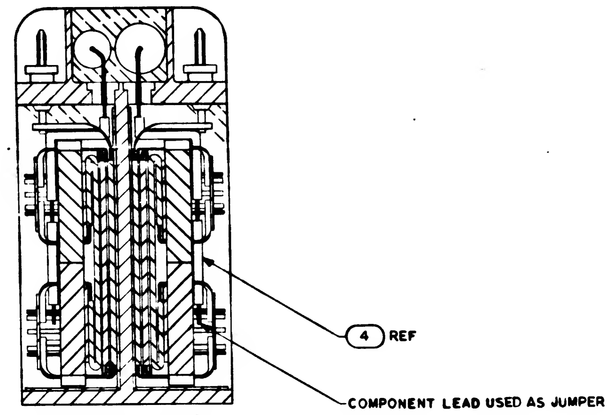
1003071

NOTICE – WHEN GOVERNMENT DRAWINGS SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED FURNISHED OR IN ANY WAY SUPPLIED THE SAID DRAWINGS SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE USE OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

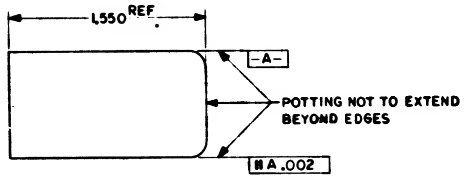
REVISIONS CLASS B TDRR 00516

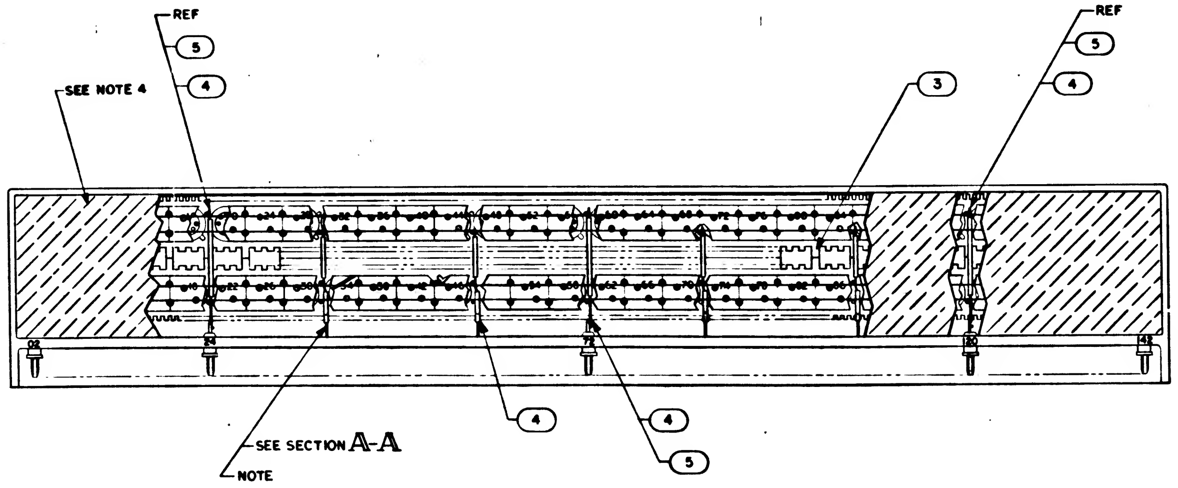
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED AND UPGRADED TO CLASS 'A' PER TDRR 00698	63	WBB WK



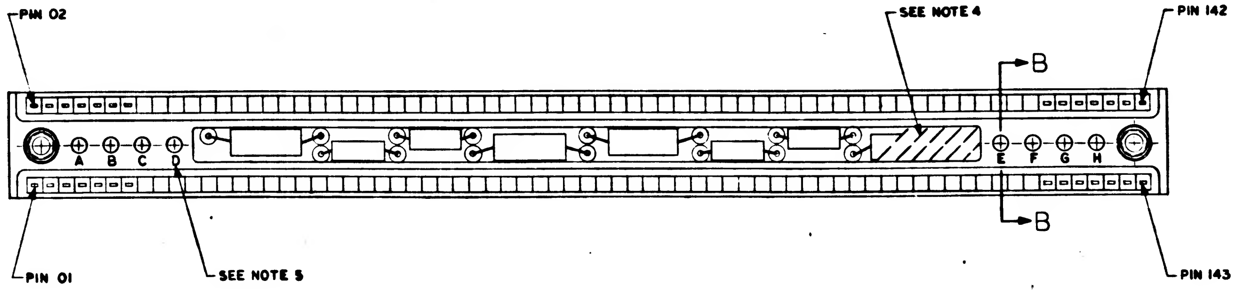


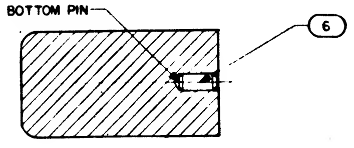
SECTION A-A
SCALE 4:1





DESCRIPTION	A	B	STICK NO.	FIND NO. 2 (ODD)	FIND NO. 3 (EVEN)	KEY POSITIONS (SEE NOTE 5)										PART NO.
						A	B	C	D	E	F	G	H			
ARITHMETIC STICK			C1-16	1003081-1	1003082-1											1003074-1





SECTION B-B

NOTES:
1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005
3. WIRE PER ND 1002003
4. ENCAPSULATE WITH POLYURETHANE FOAM PER ND 1002002 (BLACK)
5. PLUG KEY POSITIONS INDICATED IN CHART WITH FIND NO 6 AND BOND PER ND1002004
6. AR DENOTES AS REQUIRED

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
AR	1004117	PLUG, KEYING	6
AR	1006787-2	WIRE ELECTRIC .020 DIA	5
AR	1006776-21	INSULATION SLEEVING	4
1	SEE CHART	MICRO LOGIC STICK, SUB-ASSY (EVEN)	3
1	SEE CHART	MICRO LOGIC STICK, SUB-ASSY (ODD)	2
1	1003075	HEADER HOUSING SUB-ASSY	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.05 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO
CONTRACT
DRAWN DATE 5/5/63
CHECKED 5/5/63
APPROVAL WB Tursa 5/5/63
APPROVAL 8/6/63
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

HEADER HOUSING ASSY
MICRO LOGIC STICK (TAB)

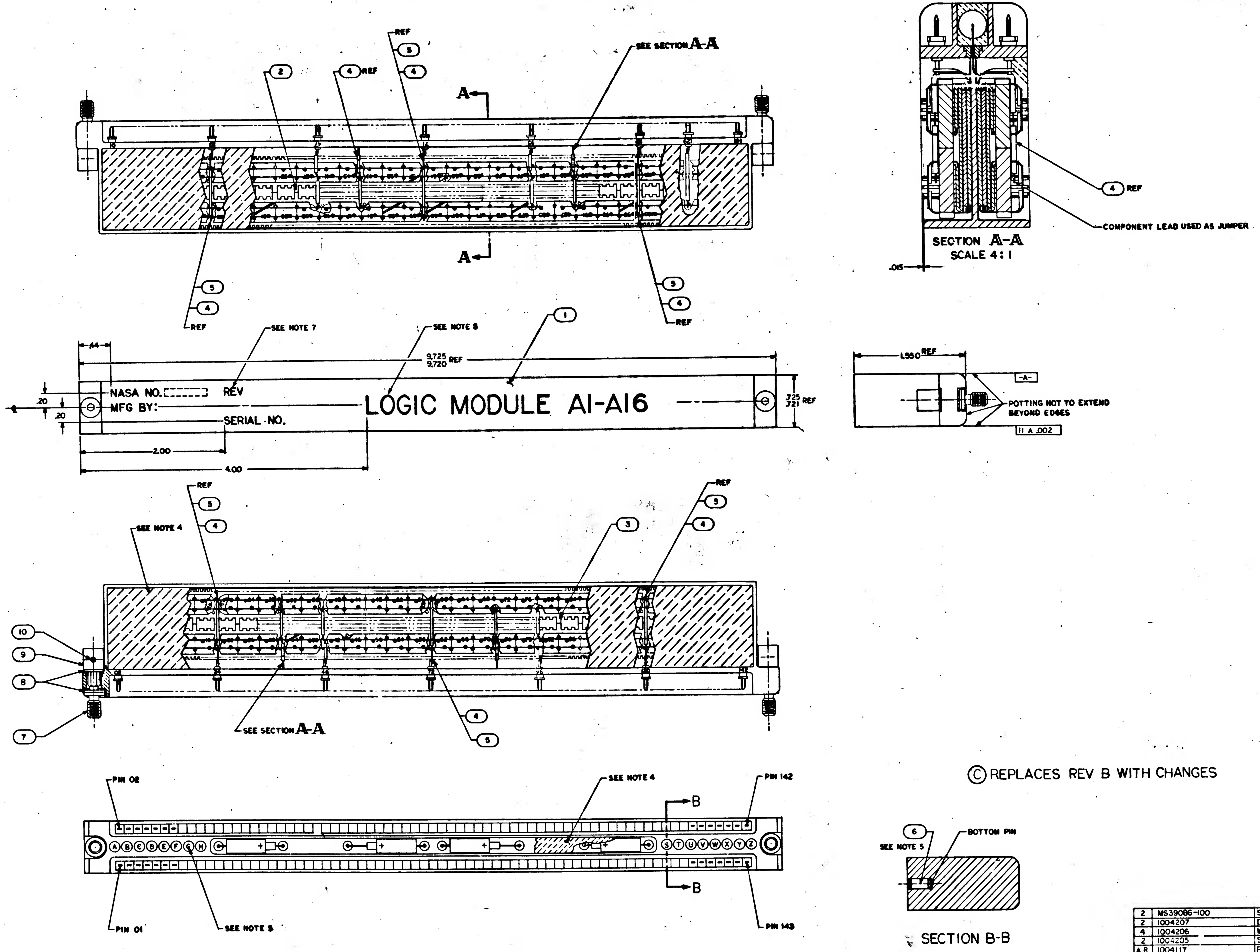
CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003074
SCALE 2/1
WT
SHEET 1 OF 1

E 1003074 A

MASTER

INCHES
PHOTOGRAPHIC SCALE ONLY

SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGES PER TDRR 030V5		



ⒸREPLACES REV B WITH CHANGES

NOTES:

1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005

4. ENCAPSULATE WITH POLYURETHANE FOAM PER ND1002002 (BLACK)
5. INSERT FIND NO.6 IN KEYING HOLES MARKED A,D,E,F,T,U,V,Y AND BOND PER ND1002004
6. AR DENOTES AS REQUIRED
7. MARK .09 HIGH WHITE PER ND1002019
8. MARK .25 HIGH WHITE PER ND1002019

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
2	MS39086-100	SPRING, SPIRAL	10
2	1004207	DRIVER, CYLINDER	9
4	1004206	WASHER, THRUST	8
2	1004205	SCREW, EJECTION	7
AR	1004117	PLUG, KEYING	6
AR	1006787-2	WIRE ELECTRIC .020 DIA	5
AR	1006776-21	INSULATION SLEEVING	4
1	1003082-1	MICRO LOGIC MODULE, SUB-ASSY (EVEN)	3
1	1003081-1	MICRO LOGIC MODULE, SUB-ASSY (ODD)	2
1	1003110	HEADER HOUSING ASSEMBLY	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.03 ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DRAWN DATE 7/2/63
CHECKED
APPROVAL 7/10/63
APPROVAL
NASA APPROVAL
MIT APPROVAL 10 Aug 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

LOGIC MODULE ASSY
NO. A1-A16

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003074
SCALE 2/1
WT
SHEET 1 OF 2

E 1003074 C

MASTER

INCHES
PHOTOGRAPHIC SCALE ONLY

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REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
C	THIS SHEET ADDED PER TDRR 03045	10/	

PART NO.	REV	EVEN	ODD	REF FLOW	REF WIRING	KEY POSITIONS
1003074-1	—	1003082-1	1003081-1	1006540	1006120	ADEFTUVY

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DRAWN
DATE
CHECKED
APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL 10/1/63

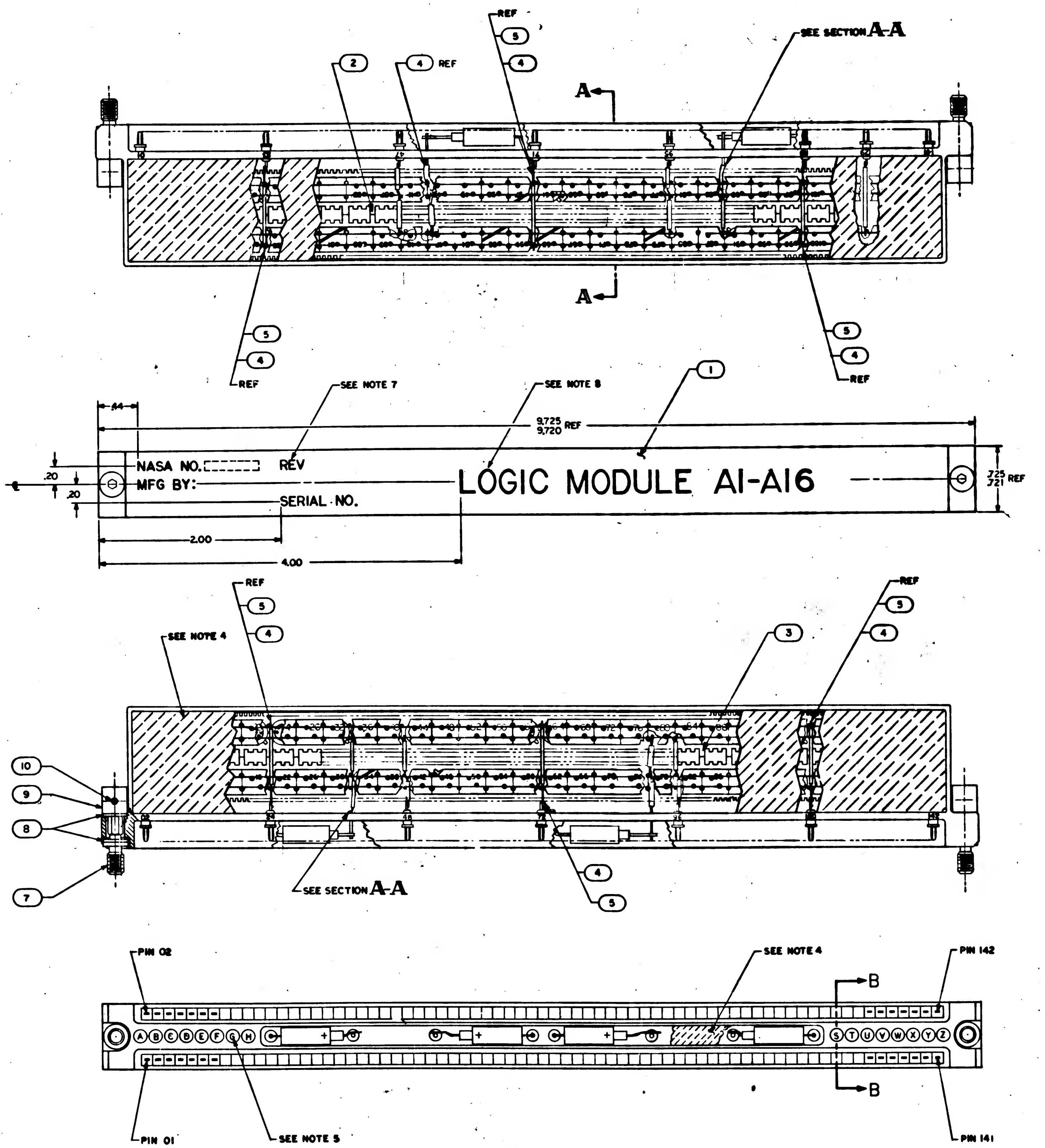
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

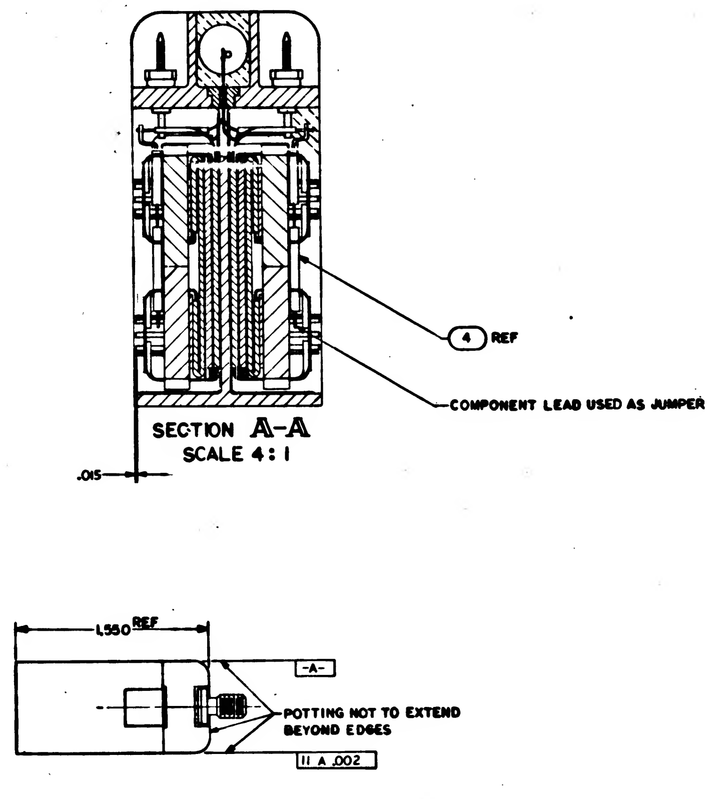
LOGIC MODULE ASSY
NO. A1-A16

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003074
SCALE
WT
SHEET 2 OF 2

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

REV	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGES PER TDRR 03045		
D	REVISED PER TDRR 05022		

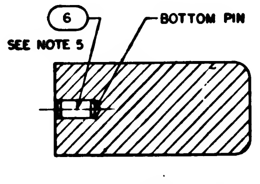




4 REF
COMPONENT LEAD USED AS JUMPER
.015
1.550 REF
-A-
POTTING NOT TO EXTEND BEYOND EDGES
⊥ A .002

SECTION A-A
SCALE 4:1

Ⓒ REPLACES REV B WITH CHANGES



SECTION B-B

NOTES:

1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005

4. ENCAPSULATE WITH POLYURETHANE FOAM PER ND 1002002 (BLACK)
5. INSERT FIND NO. 6 IN KEYING HOLES MARKED A,D,E,F,T,U,V,Y AND BOND PER ND1002004
6. AR DENOTES AS REQUIRED
7. MARK .09 HIGH WHITE PER ND1002019
8. MARK .25 HIGH WHITE PER ND1002019

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
2	MS39086-100	SPRING, SPIRAL	10
2	1004207	DRIVER, CYLINDER	9
4	1004206	WASHER, THRUST	8
2	1004205	SCREW, EJECTION	7
AR	1004117	PLUG, KEYING	6
AR	1006787-2	WIRE ELECTRIC .020 DIA	5
AR	1006776-21	INSULATION SLEEVING	4
1	1003082-1	MICRO LOGIC MODULE, SUB-ASSY (EVEN)	3
1	1003081-1	MICRO LOGIC MODULE, SUB-ASSY (ODD)	2
1	1003110	HEADER HOUSING ASSEMBLY	1

LIST OF MATERIALS

NEXT ASSY	USED ON	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± — DECIMALS ± .05 ANGLES ± — DO NOT SCALE THIS DRAWING
APPLICATION		MATERIAL —
		HEAT TREATMENT —
		FINAL FINISH —

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS

DRAWN DATE 7/24/63
CHECKED
APPROVAL 7/4/63
APPROVAL
NASA APPROVAL
MIT APPROVAL W. Kupfer

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

LOGIC MODULE ASSY
NO. A1-A16

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003074
SCALE 2/1
WT
SHEET 1 OF 2

E 1003074 D

MASTER

INCHES
0 1
PHOTOGRAPHIC SCALE ONLY

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REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
C	THIS SHEET ADDED PER TDRR 03045	10/[illegible]63	WK
D	REVISED PER TDRR 04023	[illegible]	WK

PART NO.	REV	EVEN	ODD	REF FLOW	REF WIRING	KEY POSITIONS
1003074-1	●	1003082-1	1003081-1	1006540	1006120	ADEFTUVY

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO CONTRACT
DRAWN DATE
CHECKED
APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL 10/[illegible]/63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

LOGIC MODULE ASSY
NO. A1-A16

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003074
SCALE
WT
SHEET 2 OF 2

E 1003074 D

MASTER

INCHES
PHOTOGRAPHIC SCALE ONLY

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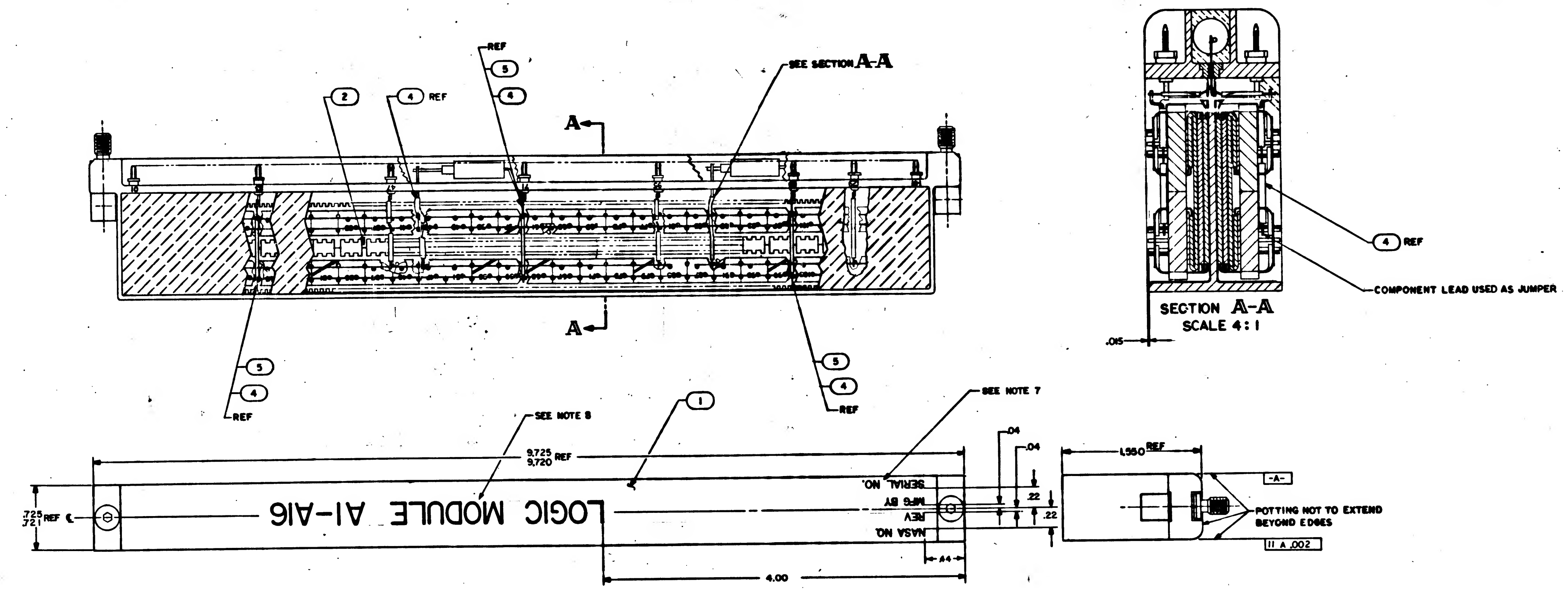
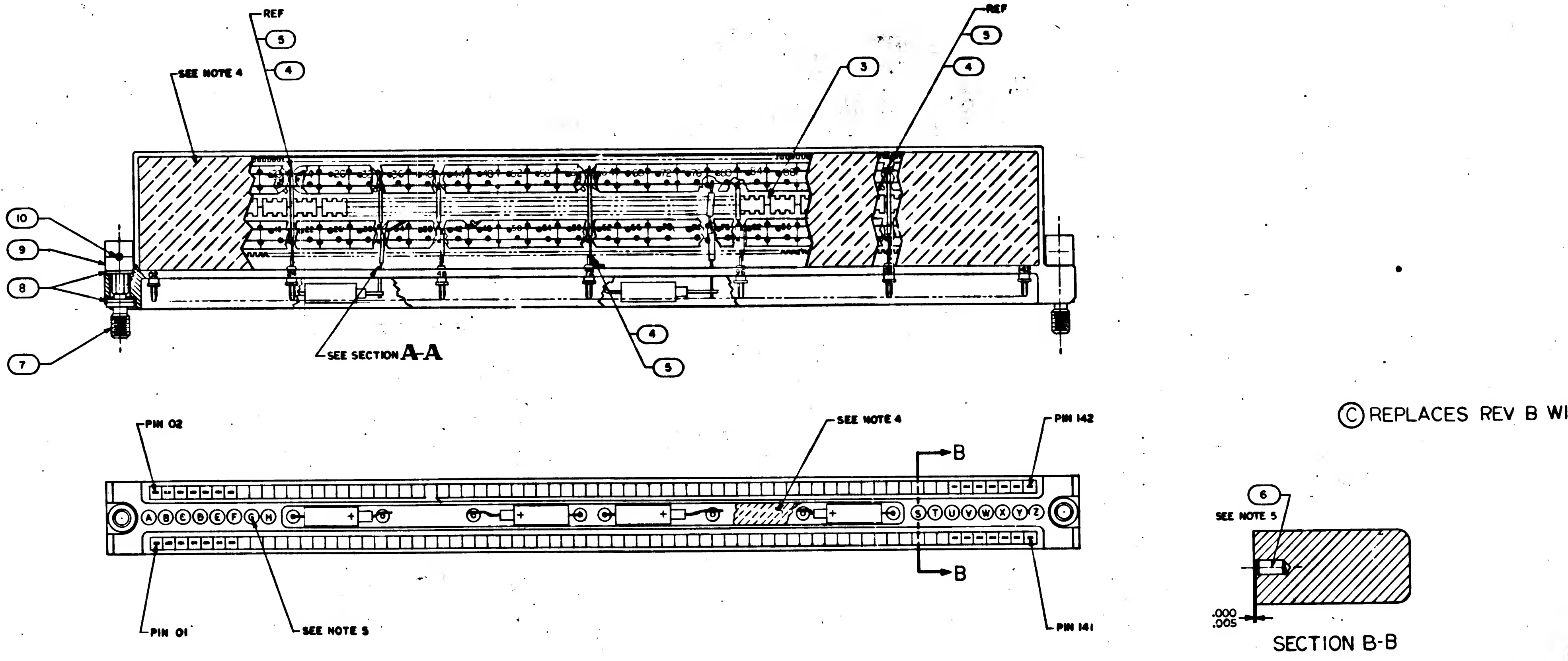
REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGES PER TDRR 03045	[illegible]	[illegible]
D	REVISED PER TDRR 04022	9-?-63	[illegible]
E	REVISED PER TDRR 34346	8-20-63	[illegible]





Ⓒ REPLACES REV B WITH CHANGES

NOTES:
1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005

4. ENCAPSULATE WITH POLYURETHANE FOAM PER ND 1002002 (BLACK)
5. INSERT FIND NO.6 IN KEYING POSITIONS PER CHART AND BOND PER ND1002004
6. AR DENOTES AS REQUIRED
7. MARK .09 HIGH WHITE PER ND1002019
8. MARK .25 HIGH WHITE PER ND1002019

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
2	MS39086-100	SPRING, SPIRAL	10
2	1004207	DRIVER, CYLINDER	9
4	1004206	WASHER, THRUST	8
2	1004205	SCREW, EJECTION	7
AR	1004117	PLUG, KEYING	6
AR	1006787-2	WIRE ELECTRIC .020 DIA	5
AR	1006776-21	INSULATION SLEEVING	4
1	1003082-1	MICRO LOGIC MODULE, SUB-ASSY (EVEN)	3
1	1003081-1	MICRO LOGIC MODULE, SUB-ASSY (ODD)	2
1	1003110	HEADER HOUSING ASSEMBLY	1

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ±.03 ANGLES ± —
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MATERIAL —
HEAT TREATMENT —
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DRAWN [illegible] DATE 7/23/63
CHECKED [illegible]
APPROVAL W.B. [illegible] 7/24/63
APPROVAL [illegible]
NASA APPROVAL [illegible]
MIT APPROVAL W. [illegible]

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

LOGIC MODULE ASSY
NO. A1-A16

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003074
SCALE 2/1
WT
SHEET 1 OF 2

1003074 E

MASTER

INCHES
PHOTOGRAPHIC SCALE ONLY

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REVISIONS

	SYM	DESCRIPTION	DATE	APPROVAL
④	C	THIS SHEET ADDED PER TDRR 03045	10/4/63	[illegible]
⑧	D	REVISED PER TDRR 04027	[illegible]	[illegible]
	E	REVISED PER TDRR 04345	10-30-63	[illegible]

PART NO.	REV	EVEN	ODD	REF FLOW	REF WIRING	KEY POSITIONS
1003074-1	8	1003082-1	1003081-1	1006540	1006120	ADEFTUVY

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

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FRACTIONS ± DECIMALS ± ANGLES ±
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CAMBRIDGE, MASS.
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APPROVAL [illegible] [illegible]
APPROVAL [illegible]
NASA APPROVAL [illegible]
MIT APPROVAL [illegible] 10/29/63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

LOGIC MODULE ASSY
NO. A1-A16

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003074
SCALE
WT
SHEET 2 OF 2

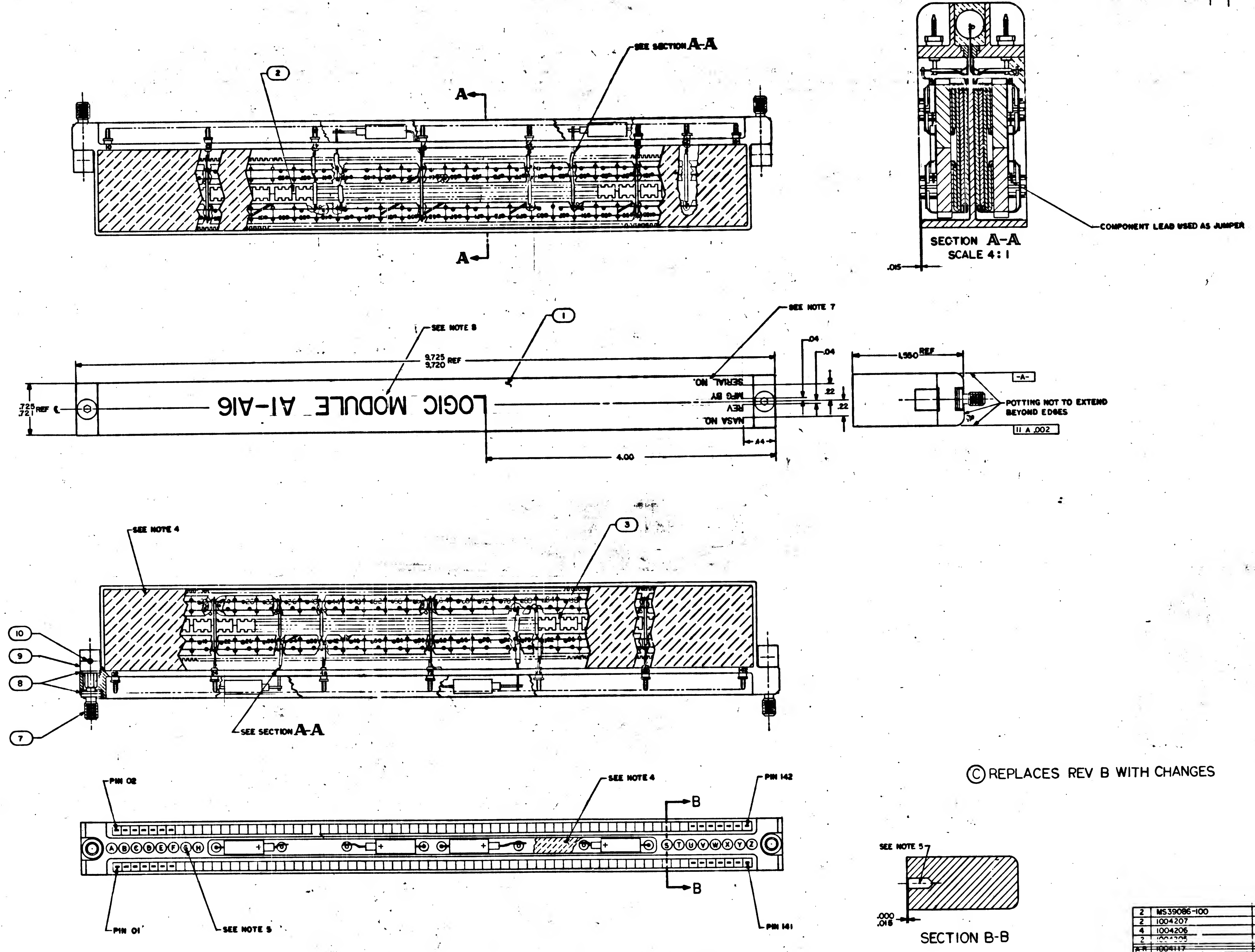
1003074 E

MASTER

INCHES
PHOTOGRAPHIC SCALE ONLY

[illegible]

	REVISIONS		
SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGES PER TDRR 03045		
D	REVISED PER TDRR 04022		
E	REVISED PER TDRR 34745		
F	REVISED PER TDRR 346.5		



Ⓒ REPLACES REV B WITH CHANGES

NOTES:

1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1008005

4. ENCAPSULATE WITH POLYURETHANE FOAM PER ND1002002 (BLACK)
5. FILL KEYING POSITIONS INDICATED BY CHART WITH THERMALLY CONDUCTIVE EPOXY RESIN PER ND1002117
6. AR DENOTES AS REQUIRED
7. MARK .09 HIGH WHITE PER ND1002019
8. MARK .25 HIGH WHITE PER ND1002019

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
2	MS39086-100	SPRING, SPIRAL	10
2	1004207	DRIVER, CYLINDER	9
4	1004206	WASHER, THRUST	8
2	1004205	SCREW, EJECTION	7
~~A-R~~	~~1004117~~	~~PLUG, KEYING~~	~~6~~
~~A-R~~	~~1006787-2~~	~~WIRE ELECTRIC .020 DIA~~	~~5~~
~~A-R~~	~~1005775-21~~	[illegible]	[illegible]
1	1003082-1	MICRO LOGIC MODULE, SUB-ASSY (EVEN)	3
1	1003081-1	MICRO LOGIC MODULE, SUB-ASSY (ODD)	2
1	1003110	HEADER HOUSING ASSEMBLY	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± —
DECIMALS ±.03
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MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

LOGIC MODULE ASSY
NO. A1-A16

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003074
SCALE 2/1
WT
SHEET 1 OF 2

E 1003074

MASTER

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REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
C	THIS SHEET ADDED PER TDRR 03045	10/[illegible]63	
D	REVISED PER TDRR 04023	10-[illegible]-63	
E	REVISED PER TDRR 04345	10-30-63	
F	REVISED PER TDRR 04615	11-18-63	

PART NO.	REV	EVEN	ODD	REF FLOW	REF WIRING	KEY POSITIONS
1003074-1	B	1003082-1	1003081-1	1006540	1006120	ADEFTUVY

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

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CONTRACT
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DATE
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APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL 10/4/63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

LOGIC MODULE ASSY
NO. A1-A16

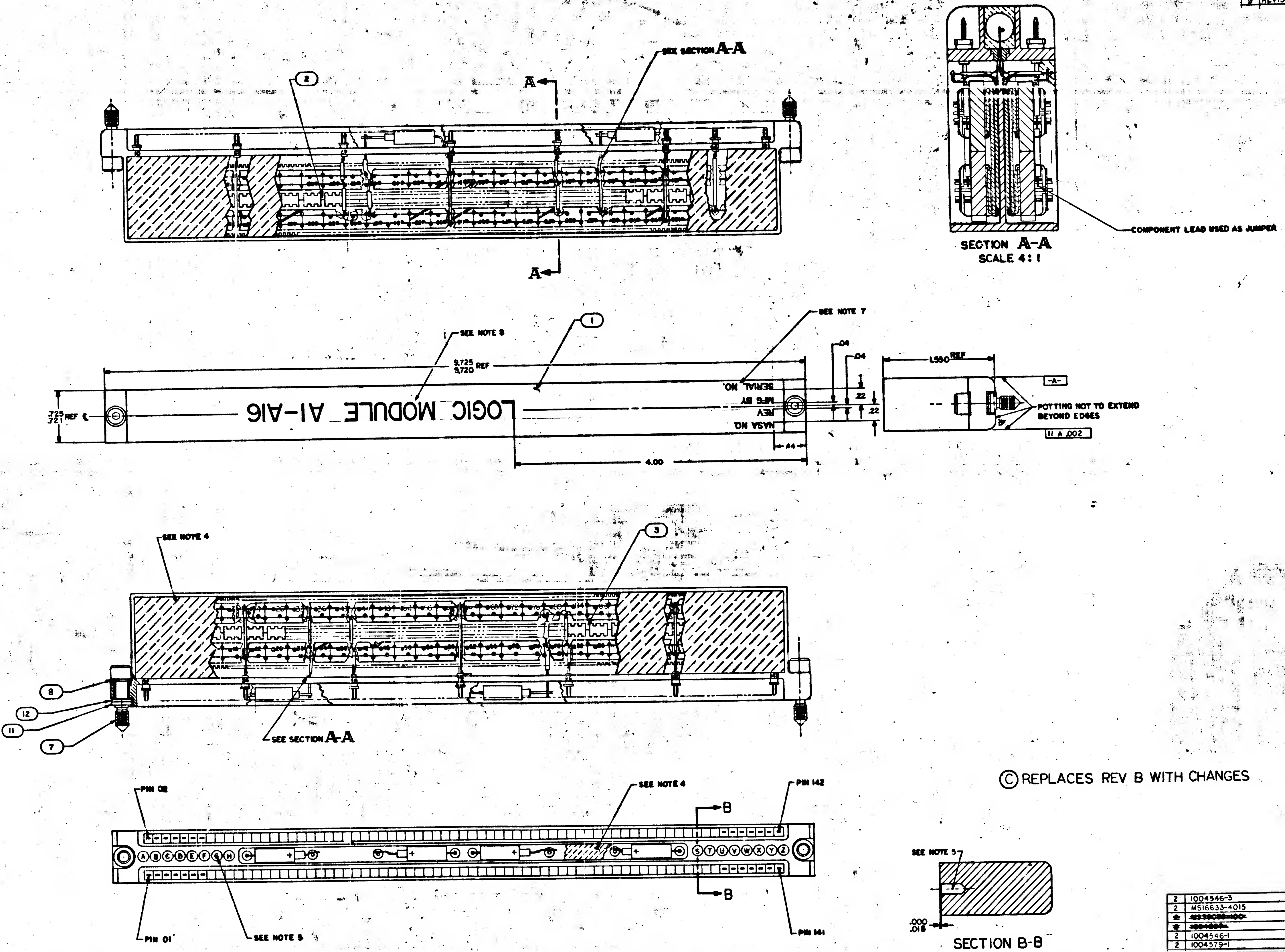
CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003074
SCALE
WT
SHEET 2 OF 2

1003074 F

MASTER

INCHES
PHOTOGRAPHIC SCALE ONLY

SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGES PER TDRR 03045	[illegible]	[illegible]
D	REVISED PER TDRR 04022	[illegible]	[illegible]
E	REVISED PER TDRR 34746	[illegible]	[illegible]
F	REVISED PER TDRR 04615	[illegible]	[illegible]
G	REVISED PER TDRR 04546	[illegible]	[illegible]



Ⓒ REPLACES REV B WITH CHANGES

NOTES:

1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005
4. ENCAPSULATE WITH POLYURETHANE FOAM PER ND 1002002 (BLACK)
5. FILL KEYING POSITIONS INDICATED BY CHART WITH THERMALLY CONDUCTIVE EPOXY RESIN PER ND1002183
6. AR DENOTES AS REQUIRED
7. MARK .09 HIGH WHITE PER ND1002019
8. MARK .25 HIGH WHITE PER ND1002019

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
2	1004546-3	WASHER, FLAT	12
2	MS16633-4015	RING, RETAINING, EXTERNAL "E"	11
~~2~~	~~MS35[illegible]-100~~	~~SPRING, [illegible]~~	~~10~~
~~2~~	~~100[illegible]~~	~~DRIVER, CYLINDER~~	~~9~~
2	1004546-1	WASHER, FLAT	8
2	1004579-1	SCREW, JACKING	7
~~AR~~	~~1004777~~	~~[illegible]~~	~~6~~
~~AR~~	~~1006787-2~~	~~WIRE, ELECTRIC [illegible] DIA~~	~~5~~
~~AR~~	~~1006776-21~~	~~INSULATION SLEEVING~~	~~4~~
1	1003082-1	MICRO LOGIC MODULE SUB-ASSY (EVEN)	3
1	1003081-1	MICRO LOGIC MODULE SUB-ASSY (ODD)	2
1	1003110	HEADER HOUSING ASSEMBLY	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

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DIMENSIONS ARE IN INCHES
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APPROVAL [illegible]
APPROVAL [illegible]
NASA APPROVAL [illegible]
MIT APPROVAL [illegible]

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

LOGIC MODULE ASSY
NO. A1-A16

CODE IDENT NO. — SIZE E NASA DRAWING NO. 1003074
SCALE 2/1 WT SHEET 1 OF 2

MASTER

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REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
C	THIS SHEET ADDED PER TDRR 03045	10/...	WK
D	REVISED PER TDRR 04027	10-18-63	WK
E	REVISED PER TDRR 04385	10-30-63	WK
F	REVISED PER TDRR 04615	11-18-63	WK
G	REVISED PER TDRR 04776	11-1863	

PART NO.	REV	EVEN	ODD	REF FLOW	REF WIRING	KEY POSITIONS
1003074-1	B	1003082-1	1003081-1	1006540	1006120	ADEFTUVY

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
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MATERIAL
HEAT TREATMENT
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CAMBRIDGE, MASS.
DWG. NO. CONTRACT
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APPROVAL W.S. [illegible] 1/10/63
APPROVAL [illegible]
NASA APPROVAL [illegible]
MIT APPROVAL W[illegible] 10/[illegible]/63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

LOGIC MODULE ASSY
NO. A1-A16

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003074
SCALE
WT
SHEET 2 OF 2

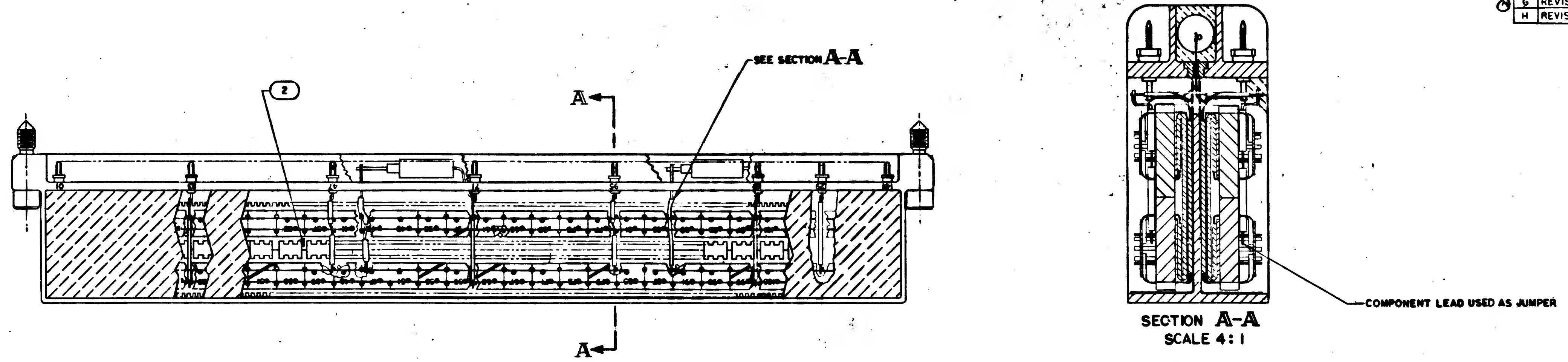
E 1003074 G

MASTER

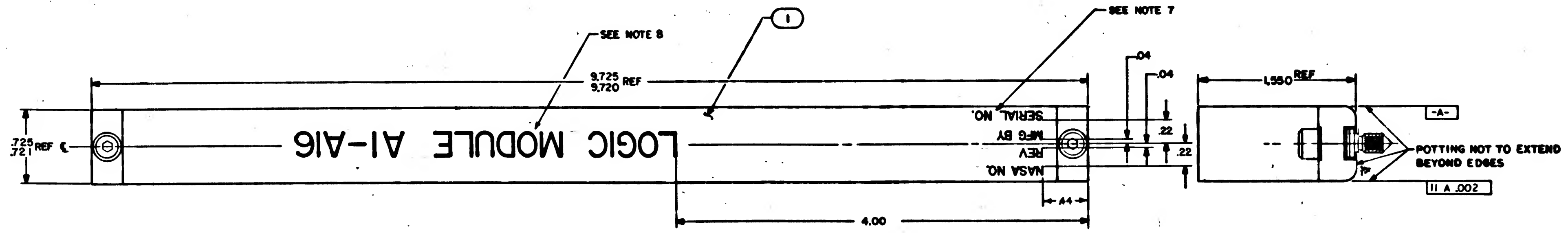
INCHES
PHOTOGRAPHIC SCALE ONLY

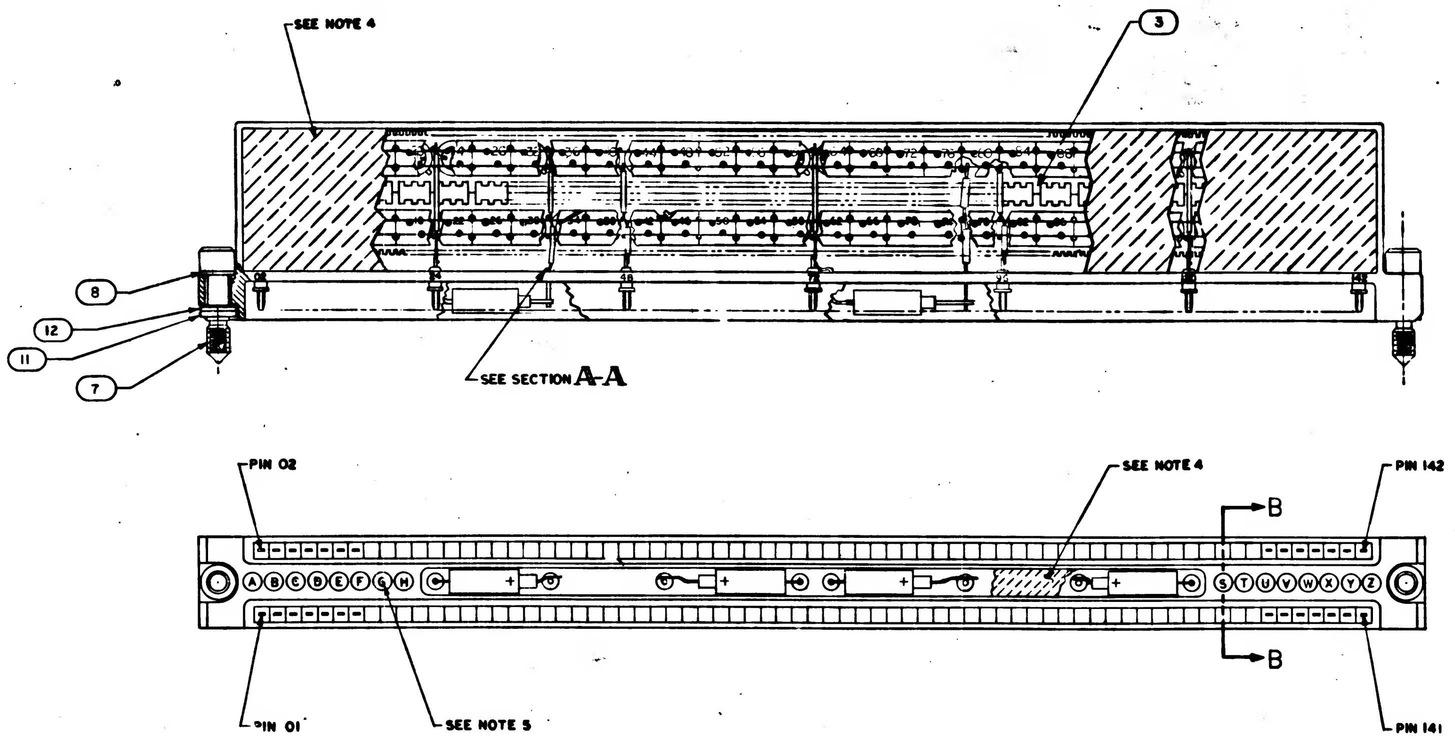
NOTICE — [illegible]

REV	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGES PER TDRR 03045	[illegible]	[illegible]
D	REVISED PER TDRR 04022	[illegible]-63	[illegible]
E	REVISED PER TDRR [illegible]	[illegible]	[illegible]
F	REVISED PER TDRR [illegible]	[illegible]	[illegible]
G	REVISED PER TDRR [illegible]	[illegible]	[illegible]
H	REVISED PER TDRR- 06024	[illegible]	[illegible]

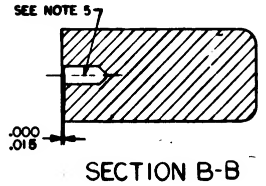


SECTION A-A
SCALE 4:1





Ⓒ REPLACES REV B WITH CHANGES



SECTION B-B

NOTES:

1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PE ND 1002005

4. ENCAPSULATE WITH POLYURETHANE FOAM PER ND1002002 (BLACK)
5. FILL KEYING POSITIONS INDICATED BY CHART WITH THERMALLY CONDUCTIVE EPOXY RESIN PER ND1002183
6. AR DENOTES AS REQUIRED
7. MARK .09 HIGH WHITE PER ND1002019 & ND1002122 TYPE II CLASS I
8. MARK .25 HIGH WHITE PER ND1002019 & ND1002122 TYPE II CLASS I

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
2	1004546-3	WASHER, FLAT	12
2	MS16633-4015	RING, RETAINING, EXTERNAL "E"	11
~~2~~	~~MS39086-100~~	~~SPRING, SPIRAL~~	~~10~~
~~2~~	~~1004809~~	~~DRIVER, CYLINDER~~	~~9~~
2	1004546-1	WASHER, FLAT	8
2	1004579-1	SCREW, JACKING	7
~~AR~~	~~1004117~~	~~PLUG, KEYING~~	~~6~~
~~AR~~	~~1006787-2~~	~~WIRE ELECTRIC .020 DIA~~	~~5~~
~~AR~~	~~1006776-21~~	~~INSULATION SLEEVING~~	~~4~~
1	1003082-1	MICRO LOGIC MODULE, SUB ASSY (EVEN)	3
1	1003081-1	MICRO LOGIC MODULE, SUB ASSY (ODD)	2
1	1003110	HEADER HOUSING ASSEMBLY	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
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FRACTIONS ± — DECIMALS ±.03 ANGLES ± —
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HEAT TREATMENT —
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DRAWN [illegible] DATE 7/21/63
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APPROVAL [illegible] 7/19/63
APPROVAL [illegible]
NASA APPROVAL [illegible]
MIT APPROVAL [illegible] Aug 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

LOGIC MODULE ASSY
NO. A1-A16

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003074
SCALE 2/1
WT
SHEET 1 OF 2

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REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
C	THIS SHEET ADDED PER TDRR 03045	10/[illegible]/63	[illegible] WK
D	REVISED PER TDRR 04022	10-26-63	[illegible] WK
E	REVISED PER TDRR 04345	10-31-63	[illegible] WK
F	REVISED PER TDRR 04613	11-8-63	[illegible] WK
G	REVISED PER TDRR 04976	11-26-63	[illegible]
H	REVISED PER TDRR 06024	[illegible] 64	[illegible]

PART NO.	REV	EVEN	ODD	REF FLOW	REF WIRING	KEY POSITIONS
1003074-1	H	1003082-1	1003081-1	1006540	1006120	ADEFTUVY

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
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INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO CONTRACT
DRAWN [illegible] DATE [illegible]
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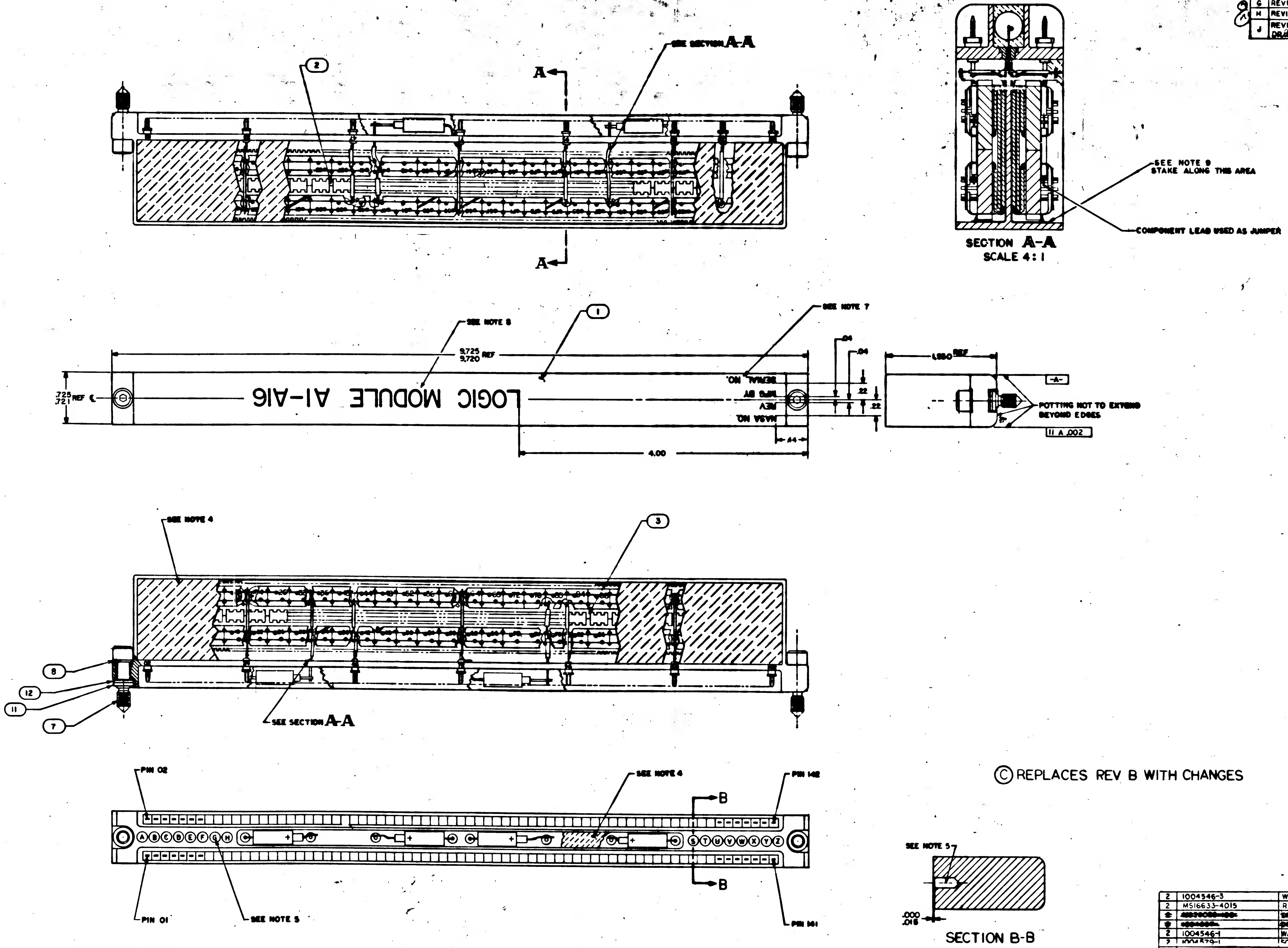
APPROVAL [illegible] 7/10/63
APPROVAL [illegible]
NASA APPROVAL [illegible] 7/1/63
MIT APPROVAL WK for 10/4/63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

LOGIC MODULE ASSY
NO. A1-A16

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003074
SCALE
WT
SHEET 2 OF 2

	[illegible]		
C	~~[illegible]~~ CHANGES PER TDRR 03045	[illegible]	[illegible]
D	REVISED PER TDRR 04022	[illegible]	[illegible]
E	REVISED PER TDRR 34345	[illegible]	[illegible]
F	REVISED PER TDRR 04615	11-12-63	[illegible]
G	REVISED PER TDRR 04776	[illegible]	[illegible]
H	REVISED PER TDRR 06024	[illegible]	[illegible]
J	REVISED PER TDRR 04778 DR [illegible] CHK A.K.B RE	[illegible]	[illegible]



Ⓒ REPLACES REV B WITH CHANGES

NOTES:

1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005

4. ENCAPSULATE WITH POLYURETHANE FOAM PER ND 1002002 (BLACK)
5. FILL KEYING POSITIONS INDICATED BY CHART WITH THERMALLY CONDUCTIVE EPOXY RESIN PER ND1002183
6. AR DENOTES AS REQUIRED
7. MARK .09 HIGH WHITE PER ND1002019 / ND1002122 TYPE II CLASS I, SERIALIZE PER ND 1002023
8. MARK .25 HIGH WHITE PER ND1002019 / ND1002122 TYPE II CLASS I
9. STAKE FIND NO. 2 & 3 TO FIND NO. 1 PER ND 1002004

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
2	1004546-3	WASHER, FLAT	12
2	MS16633-4015	RING, RETAINING, EXTERNAL "E"	11
~~2~~	~~[illegible]~~	~~SPRING, SPIRAL~~	~~10~~
~~2~~	~~[illegible]~~	~~DRIVER, CYLINDER~~	~~9~~
2	1004546-1	WASHER, FLAT	8
2	1004579-1	SCREW, JACKING	7
~~AR~~	~~1004117~~	~~PLUG, KEYING~~	~~6~~
~~AR~~	~~1006787-2~~	~~WIRE ELECTRIC .020 DIA~~	~~5~~
~~AR~~	~~[illegible]~~	~~INSULATION SLEEVING~~	~~4~~
1	1003082-1	MICRO LOGIC MODULE, SUB-ASSY (EVEN)	3
1	1003081-1	MICRO LOGIC MODULE, SUB-ASSY (ODD)	2
1	1003110	HEADER HOUSING ASSEMBLY	1

LIST OF MATERIALS

1008187	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
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CAMBRIDGE, MASS.
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APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

LOGIC MODULE ASSY
NO. A1-A16

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003074
SCALE 2/1
WT
SHEET 1 OF 2

MASTER

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REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
C	THIS SHEET ADDED PER TDRR 030U5	10/…63	WK
D	REVISED PER TDRR 04023	10-4-63	WK
E	REVISED PER TDRR 04315	10-30-63	WK
F	REVISED PER TDRR 04615	11-18-63	WK
G	REVISED PER TDRR 04778	11-12-63	
H	REVISED PER TDRR 06024	5/…64	
J	REVISED PER TDRR 09798 DR BW CHK A.P.B.	13 Jun 69	

PART NO.	REV	EVEN	ODD	REF FLOW	REF WIRING	KEY POSITIONS
1003074-1	J	1003082-1	1003081-1	1006540	1006120	ADEFTUVY

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
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APPROVAL
NASA APPROVAL
MIT APPROVAL

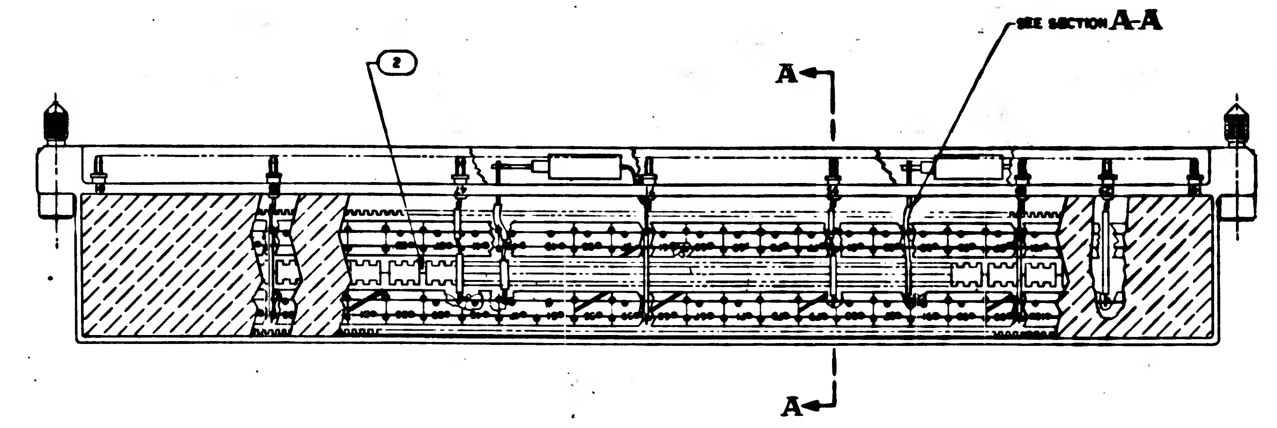
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

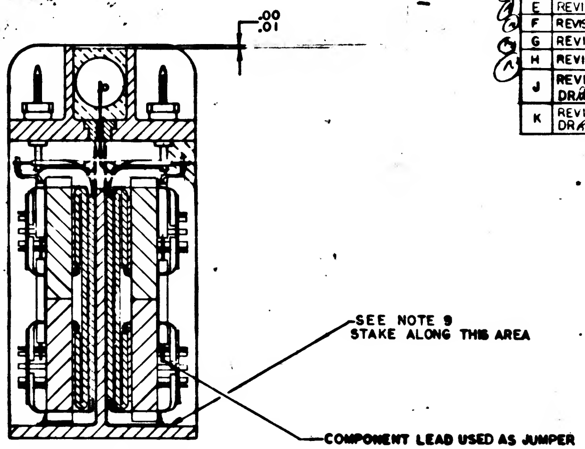
LOGIC MODULE ASSY
NO. A1-A16

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003074
SCALE
WT
SHEET 2 OF 2

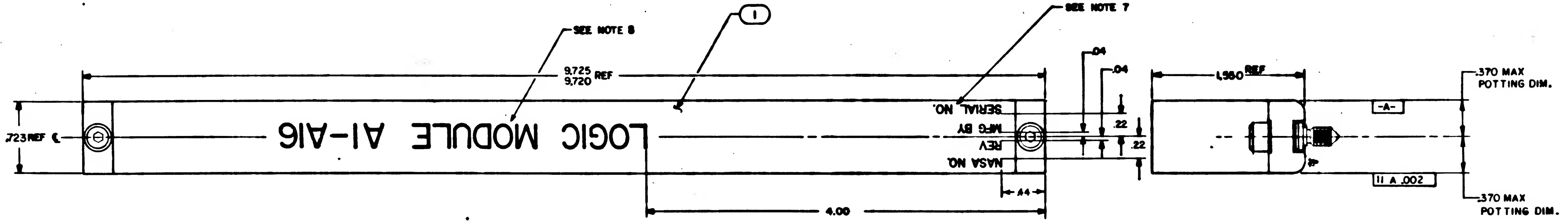
MASTER

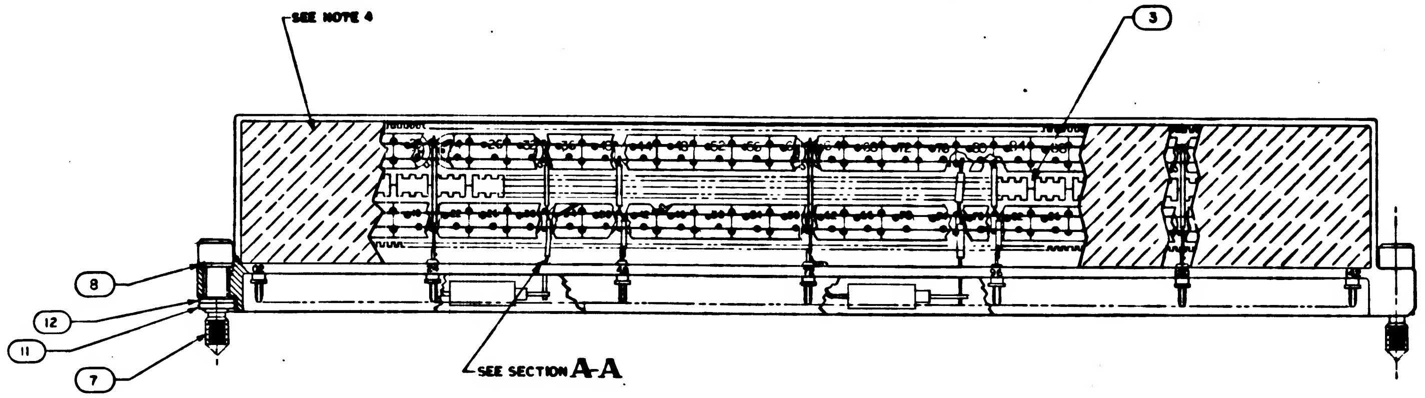
SYM	DESCRIPTION	DATE	APPROVAL
C	REPLACES REV B WITH CHANGES PER TDRR 03045	[illegible]	[illegible]
D	REVISED PER TDRR 04022	10-17-63	[illegible]
E	REVISED PER TDRR 34345	[illegible]	[illegible]
F	REVISED PER TDRR 04 5	11-13-63	[illegible]
G	REVISED PER TDRR [illegible]	[illegible]	[illegible]
H	REVISED PER TDRR- 06024	[illegible]	[illegible]
J	REVISED PER TDRR 09998 DR[illegible] CHK H.K.B REO	[illegible]	[illegible]
K	REVISED PER TDRR 11243 DR R.E.[illegible] CHK [illegible]	9/4/64	[illegible]

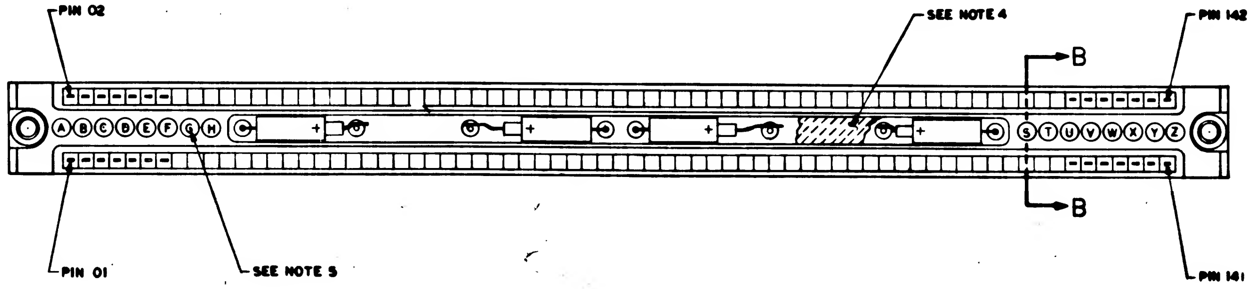




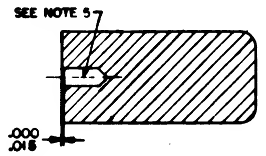
SECTION A-A
SCALE 4:1







Ⓒ REPLACES REV B WITH CHANGES



SECTION B-B

NOTES:

1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005

4. ENCAPSULATE WITH POLYURETHANE FOAM PER ND 1002002 (BLACK)
5. FILL KEYING POSITIONS INDICATED BY CHART WITH THERMALLY CONDUCTIVE EPOXY RESIN PER ND1002183
6. AR DENOTES AS REQUIRED
7. MARK .09 HIGH WHITE PER ND1002019 & ND1002122 TYPE II CLASS I, SERIALIZE PER ND 1002023
8. MARK .25 HIGH WHITE PER ND1002019 & ND1002122 TYPE II CLASS I
9. STAKE FIND NO. 2 & 3 TO FIND NO. 1 PER ND 1002004

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
2	1004546-3	WASHER, FLAT	12
2	MS16633-4015	RING, RETAINING, EXTERNAL "E"	11
~~2~~	[illegible]	~~SPRING, SPIRAL~~	~~10~~
~~2~~	[illegible]	~~DRIVER, CYLINDER~~	~~9~~
2	1004546-1	WASHER, FLAT	8
2	1004579-1	SCREW, JACKING	7
~~AR~~	~~1004117~~	~~PLUG, KEYING~~	~~6~~
~~AR~~	[illegible]	~~WIRE ELECTRIC .020 DIA~~	~~5~~
~~AR~~	~~1006776-21~~	~~INSULATION SLEEVING~~	~~4~~
1	1003082-1	MICRO LOGIC MODULE, SUB-ASSY (EVEN)	3
1	1003081-1	MICRO LOGIC MODULE, SUB-ASSY (ODD)	2
1	1003110	HEADER HOUSING ASSEMBLY	1

LIST OF MATERIALS

1003187	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
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FRACTIONS ± — DECIMALS ±.03 ANGLES ± —
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DRAWN [illegible] DATE 2/14/63
CHECKED [illegible]
APPROVAL W.B. [illegible] 3/4/63
APPROVAL [illegible]
NASA APPROVAL [illegible]
MIT APPROVAL [illegible] 10 Apr 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

LOGIC MODULE ASSY
NO. A1-A16

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003074
SCALE 2/1
WT
SHEET 1 OF 2

E 1003074 K

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REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
C	THIS SHEET ADDED PER TDRR 030US	10/[illegible]63	WK
D	REVISED PER TDRR 04023	[illegible]	WK
E	REVISED PER TDRR 04345	10-30-63	WK
F	REVISED PER TDRR 04615	11-18-63	WK
G	REVISED PER TDRR 04770	11-26-63	[illegible]
H	REVISED PER TDRR 06024	[illegible]	[illegible]
J	REVISED PER TDRR 09798 DR [illegible] CHK R.P.S.	1 June 69	[illegible]
K	REVISED PER TDRR 11243 DR P. Edwards CHK [illegible] RTM	9/17/69	[illegible]

PART NO.	REV	EVEN	ODD	REF FLOW	REF WIRING	KEY POSITIONS
1003074-1	J	1003082-1	1003081-1	1006540	1006120	ADEFTUVY

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
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MATERIAL
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DWG NO CONTRACT
DRAWN [illegible] DATE [illegible]
CHECKED [illegible]
APPROVAL [illegible]
APPROVAL [illegible]
NASA APPROVAL [illegible]
MIT APPROVAL [illegible] 10/[illegible]/63

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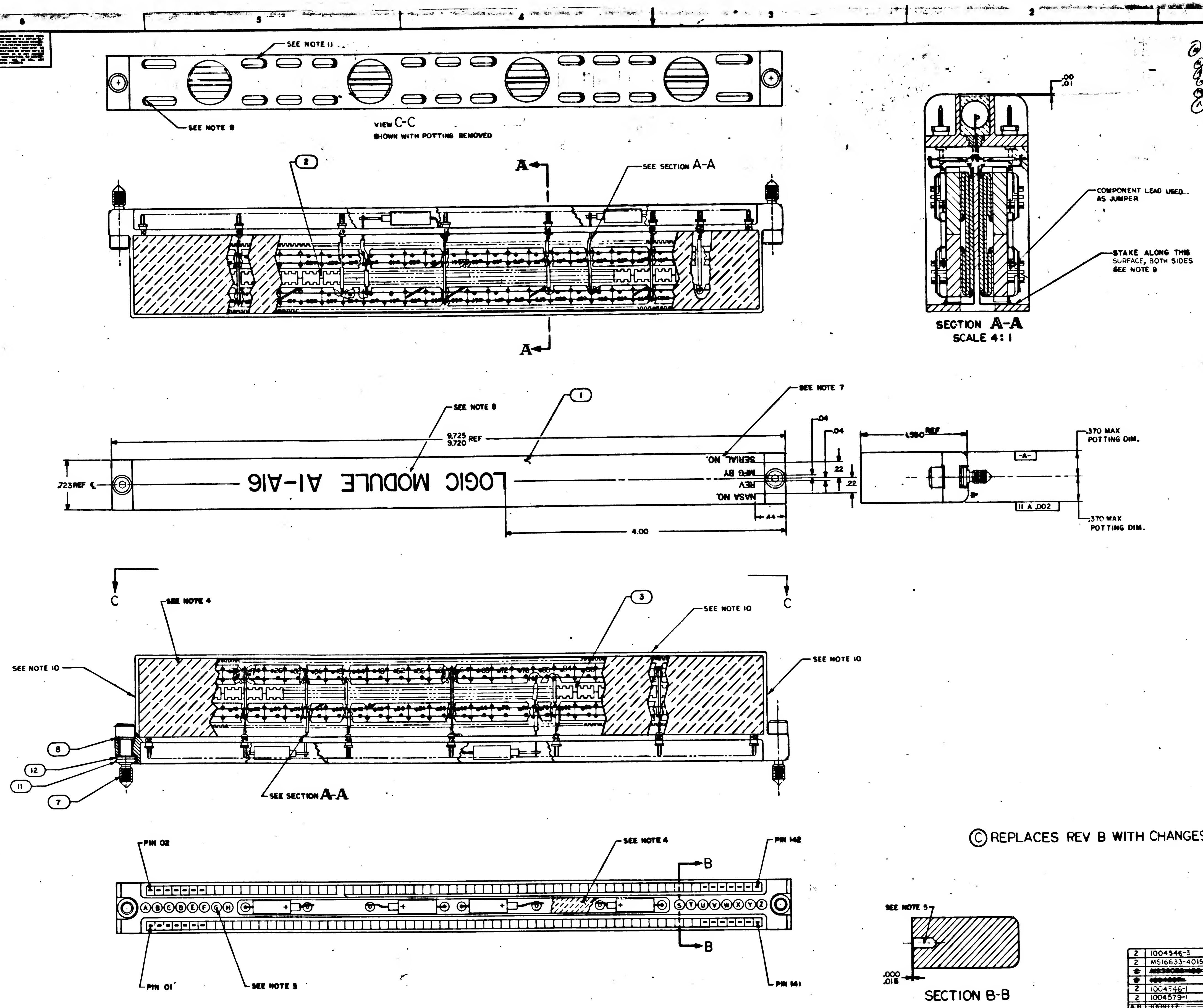
LOGIC MODULE ASSY
NO. A1-A16

CODE IDENT NO.
SIZE E
NASA DRAWING NO 1003074
SCALE
WT
SHEET 2 OF 2

C	REPLACES REV B WITH CHANGES PER TDRR 03045	[illegible]	[illegible]
D	REVISED PER TDRR 04022	10-17-63	[illegible]
E	REVISED PER TDRR 04746	[illegible]	[illegible]
F	REVISED PER TDRR 0465	11-13-63	[illegible]
G	REVISED PER TDRR 06076	11/12/63	[illegible]
H	REVISED PER TDRR- 06024	[illegible]	[illegible]
J	REVISED PER TDRR 09798 DR [illegible] CHK HKB RE	13 [illegible] 63	HWC
K	REVISED PER TDRR 11243 DR R.E. [illegible] CHK OM RTM	9/4/64	HWC
L	REVISED PER TDRR 12831 DR [illegible] CHK OM RTM	9/22/64	HWC



NOTES:

1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005

4. ENCAPSULATE WITH POLYURETHANE FOAM PER ND 1002002 (BLACK)
5. FILL KEYING POSITIONS INDICATED BY CHART WITH THERMALLY CONDUCTIVE EPOXY RESIN PER ND1002183
6. AR DENOTES AS REQUIRED
7. MARK .09 HIGH WHITE PER ND1002019 / ND1002122 TYPE II CLASS I. SERIALIZE PER ND 1002023
8. MARK .25 HIGH WHITE PER ND1002019 / ND1002122 TYPE II CLASS I
9. STAKE FIND NO. 2 & 3 TO FIND NO. 1 PER ND 1002004, FLOW STAKING COMPOUND PARTIALLY INTO SLOTS
10. SPRAY COAT TO SURFACE AND ENDS PER ND1002040 FLAT BLACK
11. POTTING MATERIAL IN SLOTS & HOLES TO BE .005 ABOVE FLUSH TO .010 BELOW FLUSH

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
2	1004546-3	WASHER, FLAT	12
2	MS16633-4015	RING, RETAINING, EXTERNAL "E"	11
~~2~~	~~MS39086-100~~	~~SPRING, SPIRAL~~	~~10~~
~~2~~	~~1004... ~~	~~DRIVER, CYLINDER~~	~~9~~
2	1004546-1	WASHER, FLAT	8
2	1004579-1	SCREW, JACKING	7
~~AR~~	~~1004117~~	~~PLUG, KEYING~~	~~6~~
~~AR~~	~~1006787-2~~	~~WIRE ELECTRIC .020 DIA~~	~~5~~
~~AR~~	~~1006776-21~~	~~INSULATION SLEEVING~~	~~4~~
1	1003082-1	MICRO LOGIC MODULE, SUB-ASSY (EVEN)	3
1	1003081-1	MICRO LOGIC MODULE, SUB-ASSY (ODD)	2
1	1003110	HEADER HOUSING ASSEMBLY	1

LIST OF MATERIALS

1003187	
NEXT ASSY	USED ON
APPLICATION	

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TOLERANCES ON
FRACTIONS ± —
DECIMALS ±.03
ANGLES ± —
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MATERIAL —
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DRAWN [illegible] DATE 7/29/63
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APPROVAL [illegible] 7/29/63
APPROVAL [illegible]
NASA APPROVAL [illegible]
MIT APPROVAL W Kupfer 16 Aug 63

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LOGIC MODULE ASSY
NO. A1-A16

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003074
SCALE 2/1
WT
SHEET 1 OF 2

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PART NO.	REV	EVEN	ODD	REF FLOW	REF WIRING	KEY POSITIONS
1003074-1	L	1003082-1	1003081-1	1006540	1006120	ADEFTUWY

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
C	THIS SHEET ADDED PER TDRR 03045	10/[illegible]	WK
D	REVISED PER TDRR 04023	[illegible]	WK
E	REVISED PER TDRR 04305	[illegible]	WK
F	REVISED PER TDRR 04615	[illegible]	WK
G	REVISED PER TDRR 04778	11-26-63	[illegible]
H	REVISED PER TDRR 06024	[illegible]	[illegible]
J	REVISED PER TDRR 09798 DR [illegible] CHK APB RSS	13 June 69	[illegible]
K	REVISED PER TDRR 11243 DR P. Edwards CHK [illegible] RTM	9/11/69	[illegible]
L	REVISED PER TDRR 12831 DR [illegible] CHK [illegible] RTM	9/20/[illegible]	[illegible]

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
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INSTRUMENTATION LAB
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DRAWN [illegible] DATE [illegible]
CHECKED [illegible]
APPROVAL [illegible] 7/10/[illegible]
APPROVAL [illegible]
NASA APPROVAL [illegible]
MIT APPROVAL WK [illegible] 10/[illegible]/63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

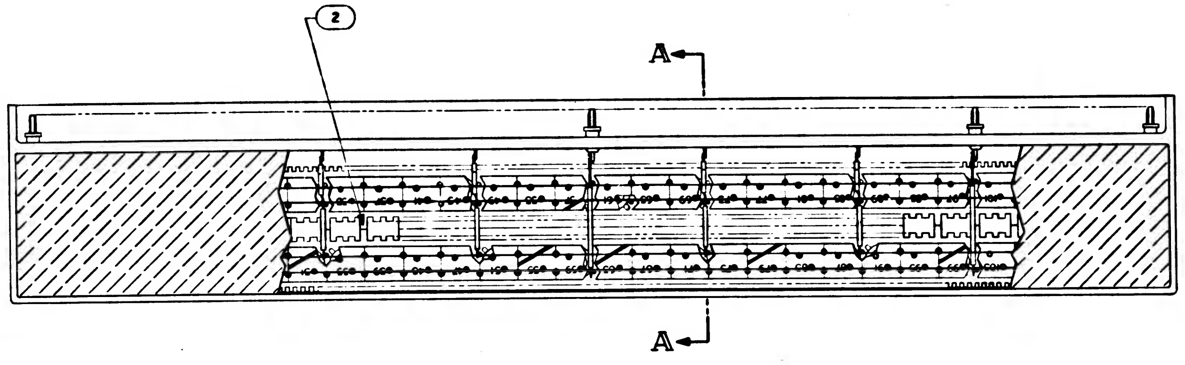
LOGIC MODULE ASSY
NO. A1-A16

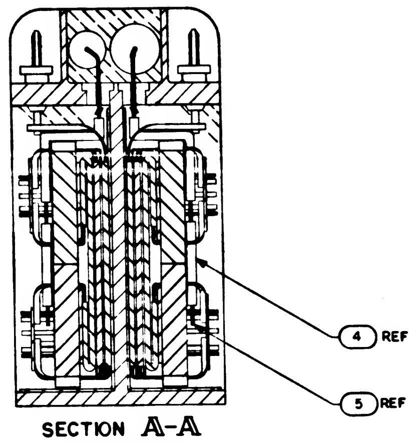
CODE IDENT NO.
SIZE E
NASA DRAWING NO 1003074
SCALE
WT
SHEET 2 OF 2

MASTER

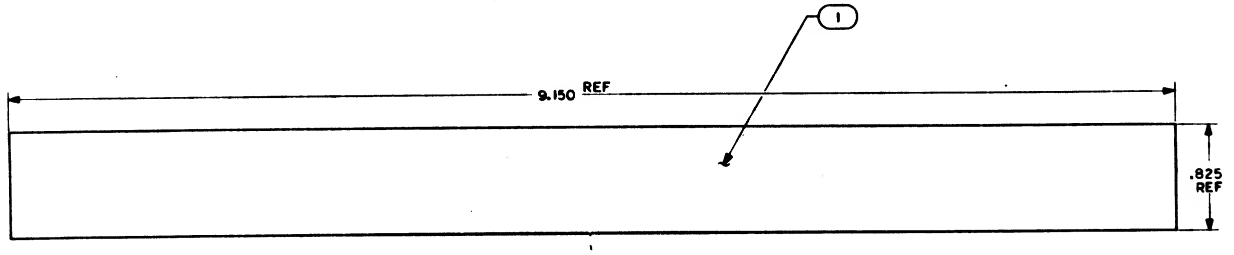
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

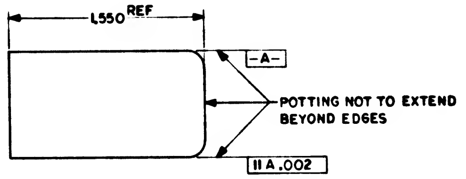
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

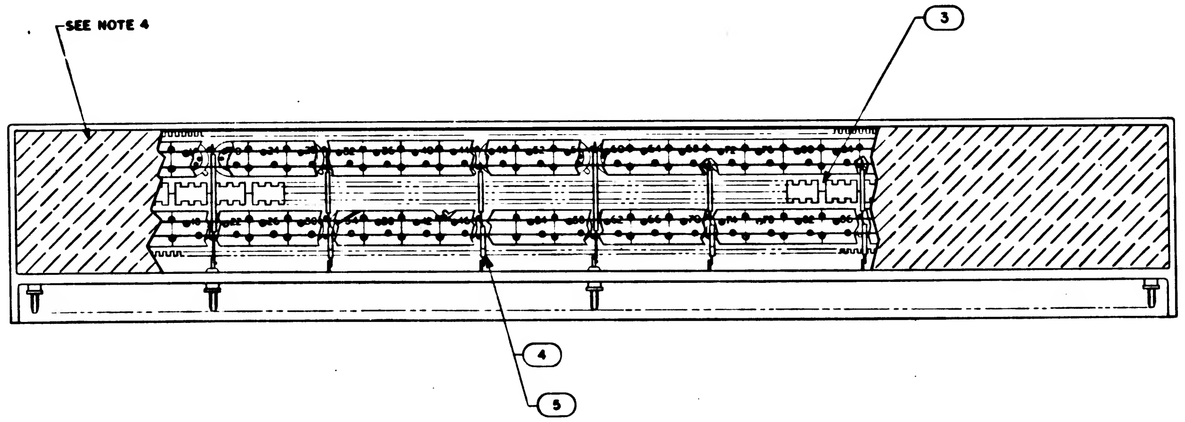


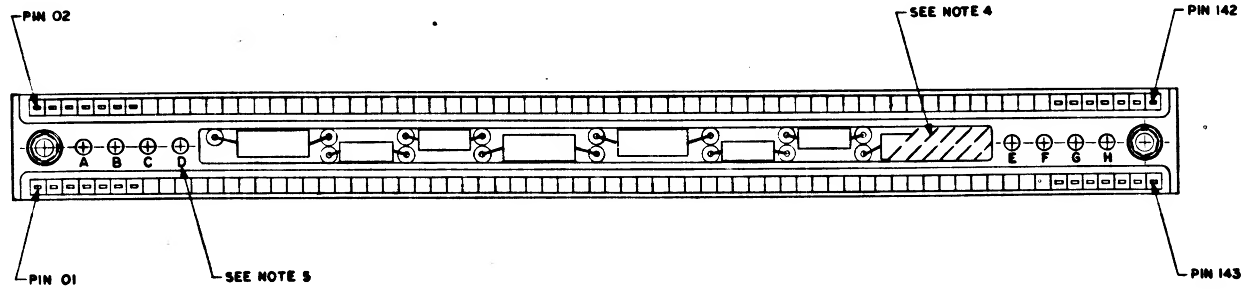


SECTION A-A
SCALE 4 : 1









DESCRIPTION	FIND NO. 2 (ODD)	FIND NO. 3 (EVEN)	KEY POSITIONS (SEE NOTE 5)										PART NO.
			A	B	C	D	E	F	G	H			
ARITHMETIC STICK (C1-16)	1003081	1003082											1003074-1

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00514 DATE 6 Mar 63

NOTES:
1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND 1002005
3. WIRE PER ND 1002003
4. ENCAPSULATE WITH POLYURETHANE FOAM PER ND 1002002 (BLACK)
5. PLUG KEY POSITIONS INDICATED IN CHART PER ND -------
6. AR DENOTES AS REQUIRED

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
AR	1006787-2	WIRE ELECTRIC .020 DIA	5
AR	1006776-21	INSULATION SLEEVING	4
1	SEE CHART	MICRO LOGIC STICK, SUB-ASSY (EVEN)	3
1	SEE CHART	MICRO LOGIC STICK, SUB-ASSY (ODD)	2
1	1003075	HEADER HOUSING SUB-ASSY	1

LIST OF MATERIALS

	GENERAL
NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ±.05 ANGLES ±
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DWG NO CONTRACT
DRAWN DATE 3/5/63
CHECKED 3/5/63
APPROVAL 3/5/63
APPROVAL 3/6/63
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

HEADER HOUSING ASSY
MICRO LOGIC STICK
(TAB)

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003074
SCALE 2/1 WT SHEET 1 OF 1

1003074

MASTER

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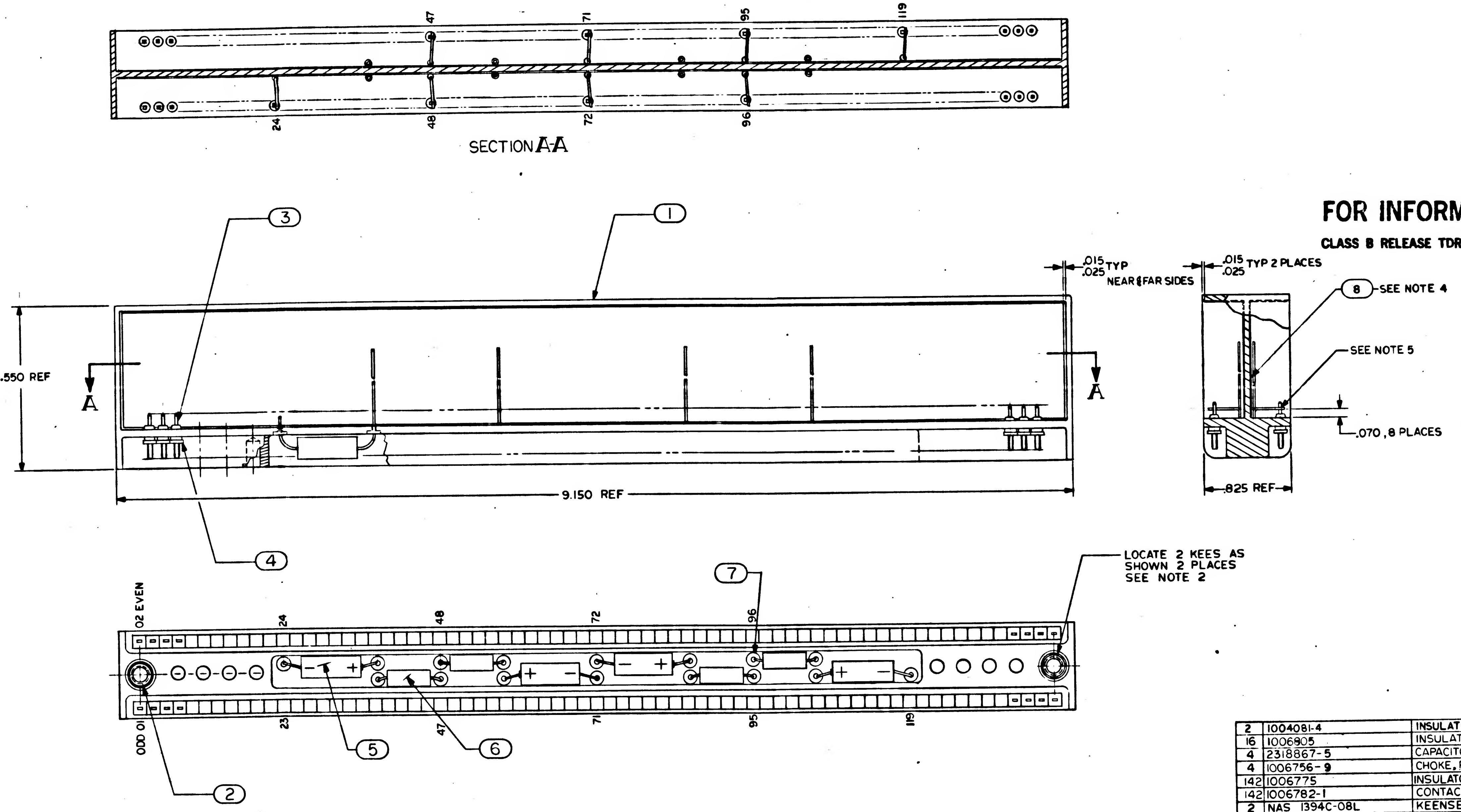
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00635	3/29/63	

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00514 DATE 6 Jun 63



QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
2	1004081-4	INSULATOR, MYLAR	8
16	1006805	INSULATOR, BUSHING	7
4	2318867-5	CAPACITOR	6
4	1006756-9	CHOKE, RF	5
142	1006775	INSULATOR WRAPOST MALE MIN	4
142	1006782-1	CONTACT WRAPOST MALE MINIATURE	3
2	NAS 1394C-08L	KEENSERT KN	2
1	1004094	HEADER HOUSING	1

LIST OF MATERIALS

NOTES:—
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. COAT THREADS AND FIND NO. 2 PER MIL-P-8585 WET ZINC CHROMATE PRIMER
3. INSTALL FIND NO. 2 (later)
4. BOND FIND NO. 8 TO FIND NO. 1 PER ND 1002004
5. WELD PER ND 1002005

MASTER

1003074	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± # DECIMALS ± # ANGLES ± #
DO NOT SCALE THIS DRAWING
MATERIAL —#—
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APPROVAL W. Tuner 3/5/63
APPROVAL
NASA APPROVAL Jack Barnard
MIT APPROVAL 6 Jun 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

HEADER HOUSING SUB ASS'Y
MICRO LOGIC STICK

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003075
SCALE 2/1
WT
SHEET 1 OF 1

1003075 A

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

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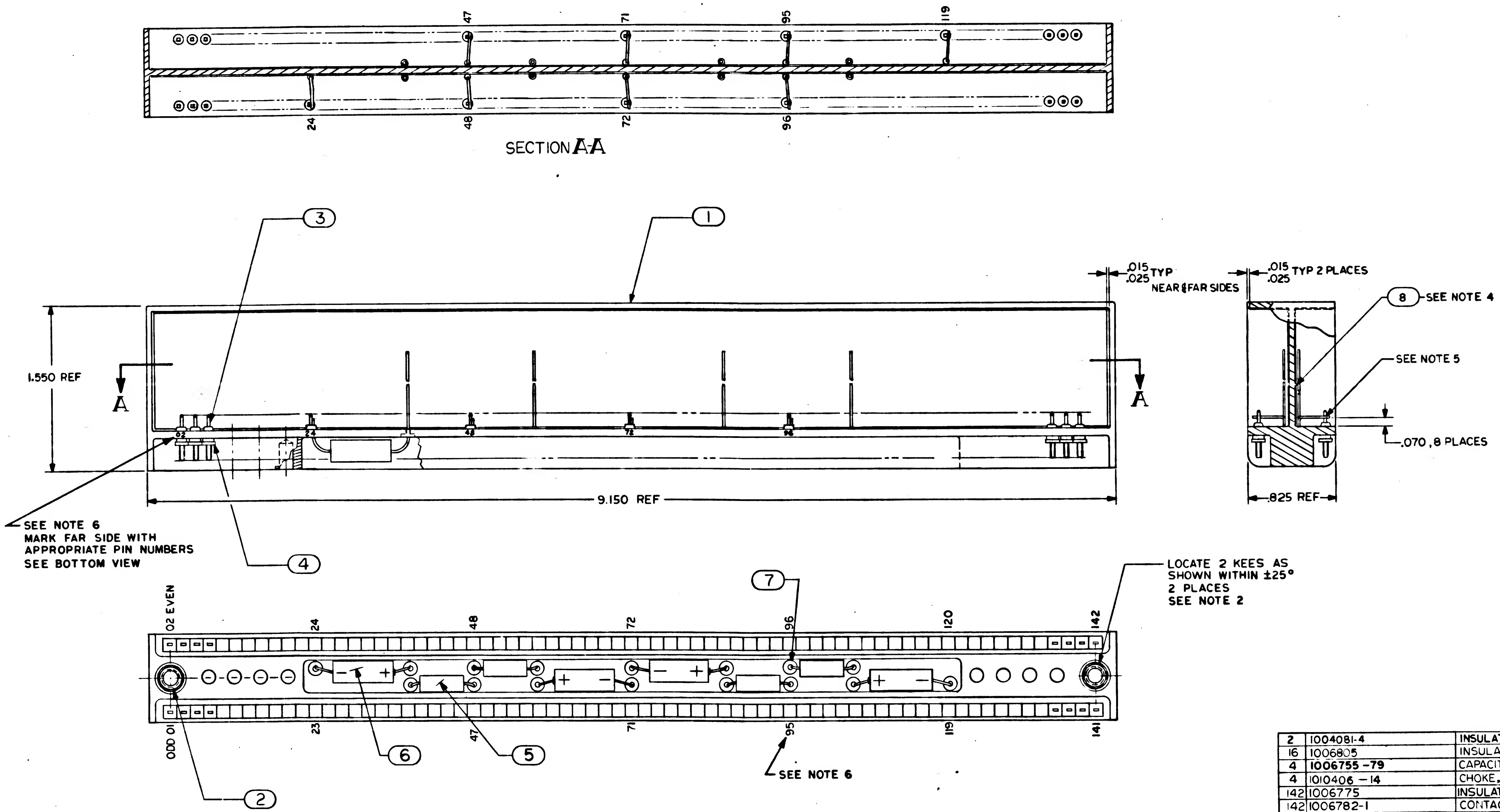
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00635	1-29-63	WT wk
B	REVISED AND UPGRADED TO CLASS A PER TDRR 00906	6 APR 63	WT WK



NOTES:–
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. COAT THREADS AND FIND NO.2 PER MIL-P-8585 WET ZINC CHROMATE PRIMER
3. INSTALL FIND NO. 2 PER ND1002121
4. BOND FIND NO. 8 TO FIND NO. 1 PER ND 1002004
5. WELD PER ND1002005
6. MARK .040 TO .080 HIGH WHITE CHARACTERS PER ND 1002019

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
2	1004081-4	INSULATOR, MYLAR	8
16	1006805	INSULATOR, BUSHING	7
4	1006755 -79	CAPACITOR	6
4	1010406 – 14	CHOKE, RF	5
142	1006775	INSULATOR WRAPOST MALE MIN	4
142	1006782-1	CONTACT WRAPOST MALE MINIATURE	3
2	NAS 1394C-08L	KEENSERT KN	2
1	1004094	HEADER HOUSING	1

LIST OF MATERIALS

MASTER

1003074	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± –#– DECIMALS ± –#– ANGLES ± –#–
DO NOT SCALE THIS DRAWING
MATERIAL –#–
HEAT TREATMENT –#–
FINAL FINISH –#–

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG NO CONTRACT
DRAWN Bonanza DATE 1-14-63
CHECKED [illegible] 3/6/63
APPROVAL W. [illegible] 3/5/63
APPROVAL [illegible] 3/6/63
NASA APPROVAL Jack Barnard
MIT APPROVAL W. [illegible] 6 Apr 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

HEADER HOUSING SUB ASS'Y
MICRO LOGIC STICK

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003075
SCALE 2/1
WT
SHEET 1 OF 1

1003075 B

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

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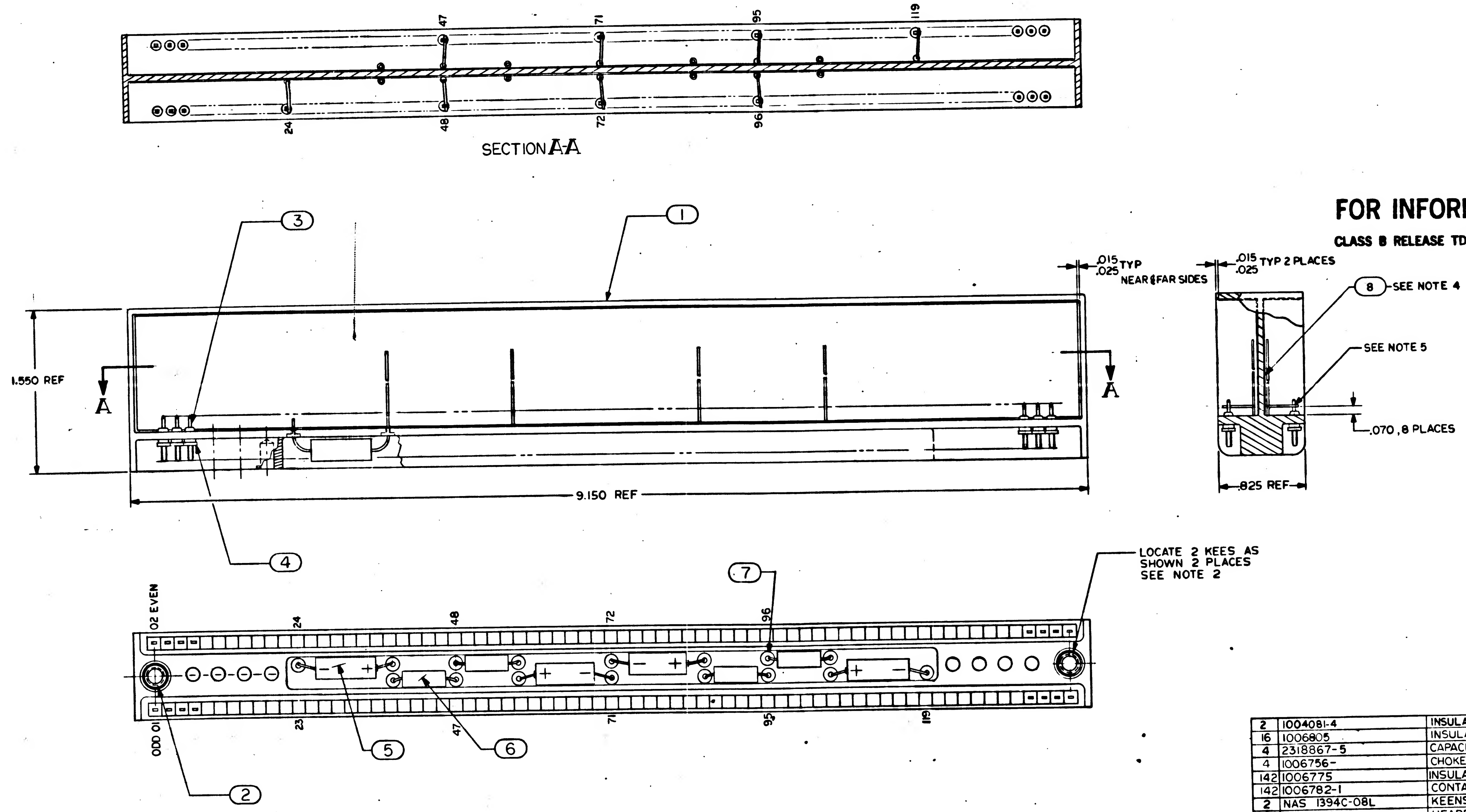
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00514 DATE 6Jun63



QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
2	1004081-4	INSULATOR, MYLAR	8
16	1006805	INSULATOR, BUSHING	7
4	2318867-5	CAPACITOR	6
4	1006756-	CHOKE, RF	5
142	1006775	INSULATOR WRAPOST MALE MIN	4
142	1006782-1	CONTACT WRAPOST MALE MINIATURE	3
2	NAS 1394C-08L	KEENSERT KN	2
1	1004094	HEADER HOUSING	1

LIST OF MATERIALS

NOTES:—
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. COAT THREADS AND FIND NO. 2 PER MIL-P-8585 WET ZINC CHROMATE PRIMER
3. INSTALL FIND NO. 2 (later)
4. BOND FIND NO. 8 TO FIND NO. 1 PER ND 1002004
5. WELD PER ND 1002005

MASTER

NEXT ASSY	USED ON
1003074	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT
DRAWN Bonanza DATE 1-14-63
CHECKED
APPROVAL W.S. Turner 3/5/63
APPROVAL
NASA APPROVAL
MIT APPROVAL 6Jun63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

HEADER HOUSING SUB ASS'Y
MICRO LOGIC STICK

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003075
SCALE 2/1
WT
SHEET 1 OF 1

1003075

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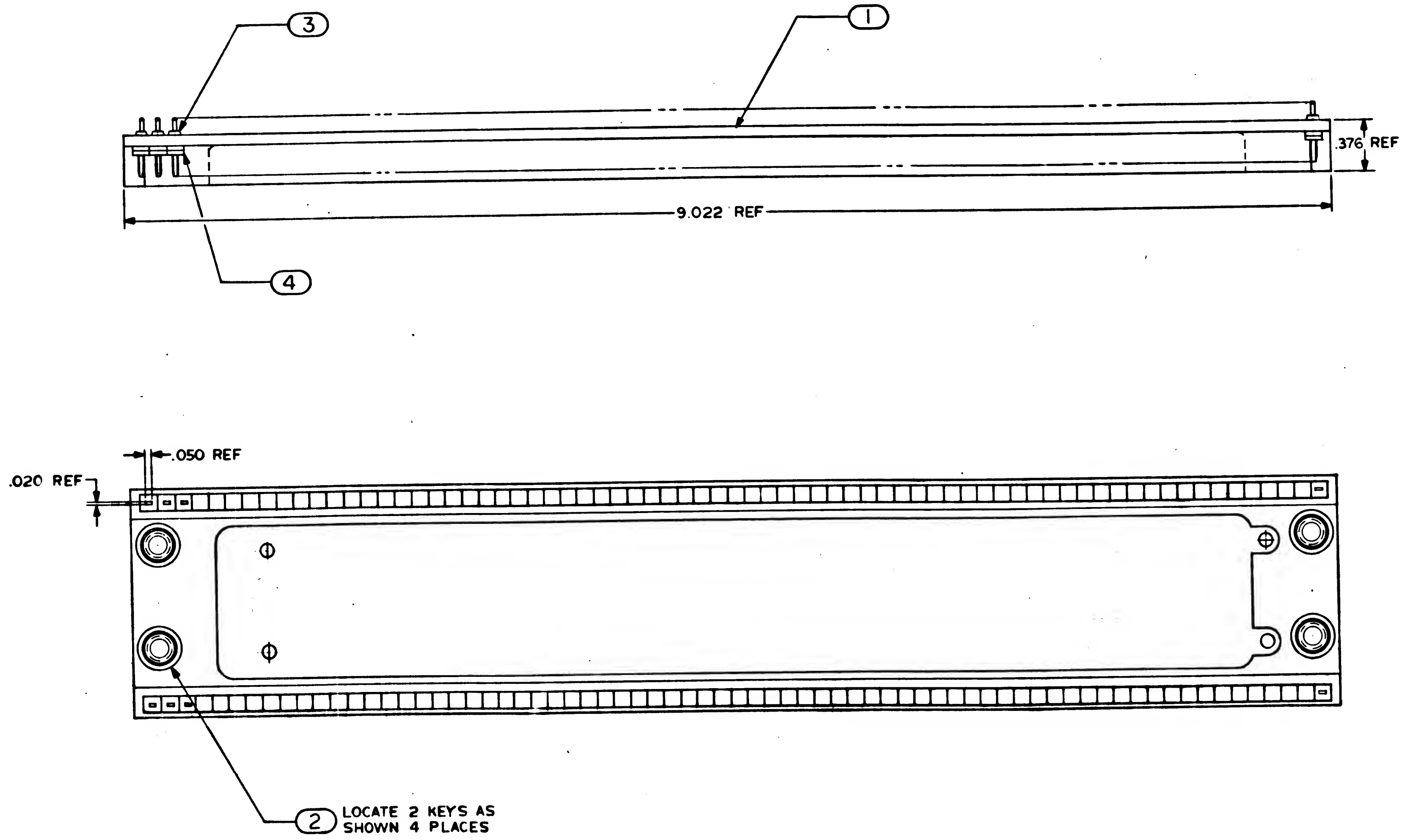
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00394	2-8-63	



FOR INFORMATION ONLY
CLASS B RELEASE TDR No. 00309 DATE 30 Jan 1963

NOTES:—
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. COAT THREADS AND FIND NO 2 PER MIL-P-8585 WET ZINC CHROMATE PRIMER
3. INSTALL FIND NO 2 PER (LATER)

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
142	1006775	INSULATOR WRAPOST MALE (MIN)	4
142	1006782-1	CONTACT WRAPOST MALE (MIN)	3
4	NAS 1394C-08L	KEENSERT KN	2
1	1004096	HEADER, REWORK	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003066	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN S. Bonanno DATE 1/16/63
CHECKED 1/17/63
APPROVAL W. Trumer 28 JAN 63
APPROVAL 29 Jan 63
NASA APPROVAL 1-30-63
MIT APPROVAL 30 Jan 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

HEADER ASSEMBLY
ERASABLE MEMORY STICK

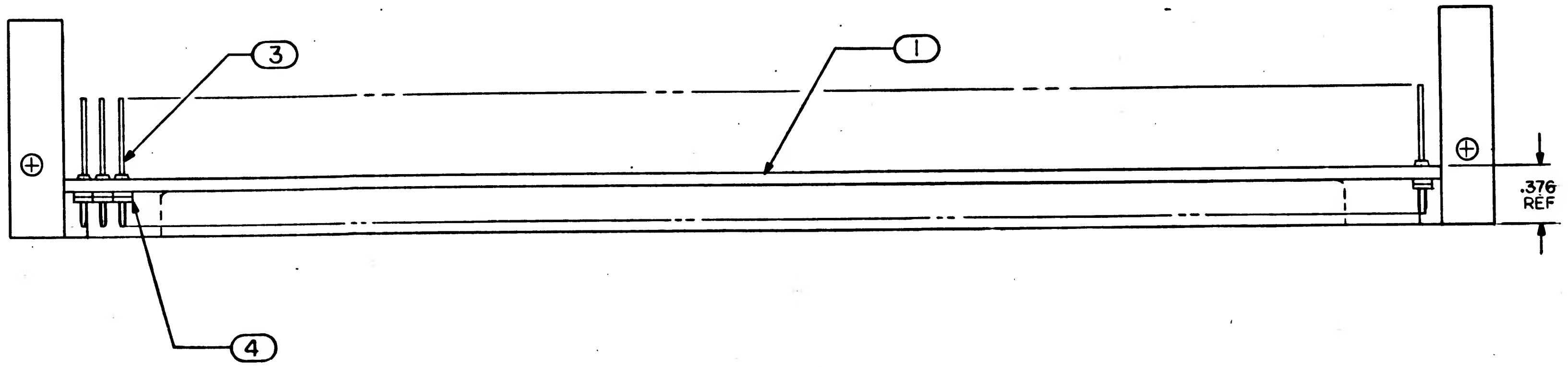
CODE IDENT NO. SIZE D NASA DRAWING NO. 1003077
SCALE 2/1 WT SHEET 1 OF 1

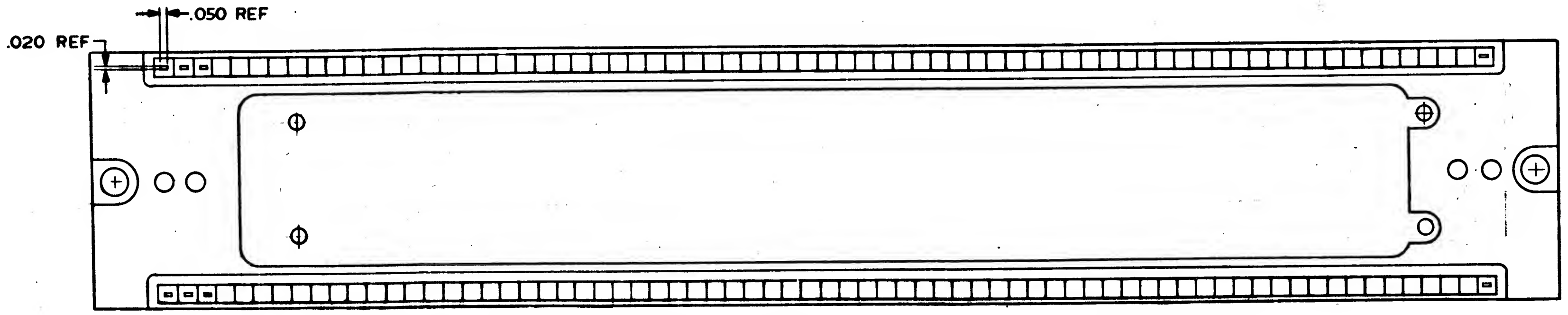
D 1003077 A

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00394	2-8-63	
B	REVISED PER TDRR 00680	3-27-63	
C	REVISED AND UPGRADED FOR CLASS A RELEASE 01820	7/2/63	





NOTES :-
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. INSTALL FIND NO.3 AND 4 IN FIND NO.1 PER ND 1002136

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
142	1006775	INSULATOR WRAPOST MALE (MIN)	4
142	1006782-2	CONTACT WRAPOST MALE (MIN)	3
			2
1	1003101	HEADER, HOUSING	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003066	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± -
DECIMALS ± -
ANGLES ± -
DO NOT SCALE THIS DRAWING
MATERIAL -
HEAT TREATMENT -
FINAL FINISH -

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN DATE 1/16/63
CHECKED 1/17/63
APPROVAL W.B. 28 JAN 63
APPROVAL
NASA APPROVAL 1-30-63
MIT APPROVAL 30 Jan 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

HEADER ASSEMBLY
ERASABLE MEMORY STICK

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003077
SCALE 2/1
WT
SHEET 1 OF 1

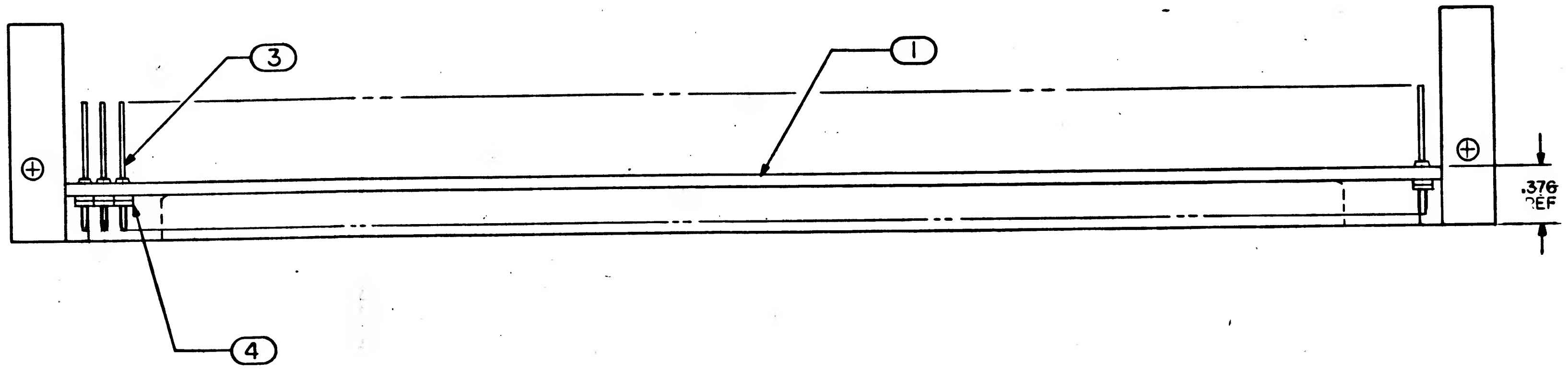
D 1003077 B

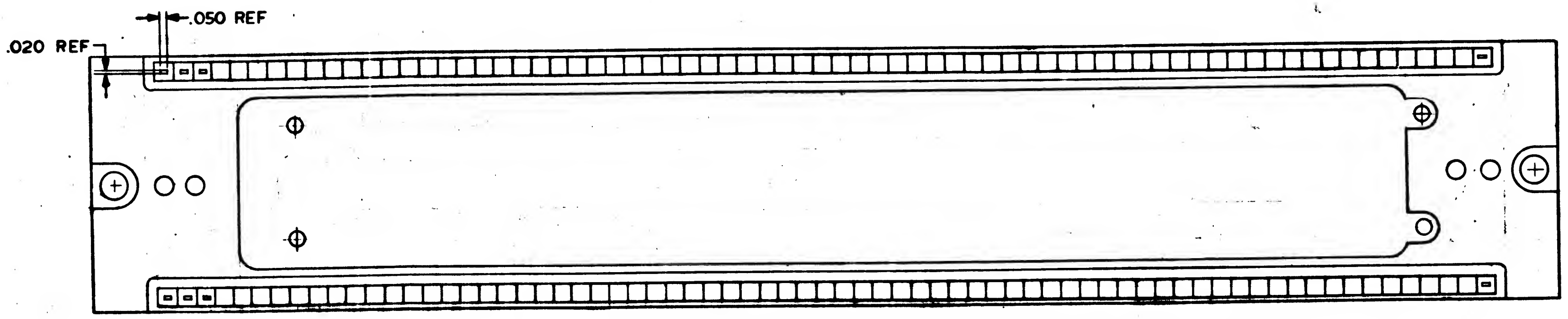
INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00394	2-8-63	WJ
B	REVISED PER TDRR 00680	3-27-63	WJ
C	REVISED AND UPGRADED FOR CLASS A RELEASE 01820	7/2/63	
D	REPLACED WITH CHANGES BY REV E PER TDRR 04155	10-23-63	EPK WJL

Ⓜ





Ⓓ REPLACED WITH CHANGES BY REV E

NOTES:—
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. INSTALL FIND NO.3 AND 4 IN FIND NO.1 PER ND 1002136

MASTER

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
142	1006775	INSULATOR WRAPOST MALE (MIN)	4
142	1006782-2	CONTACT WRAPOST MALE (MIN)	3
			2
1	1003101	HEADER, HOUSING	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003066	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN Bonanno DATE 1/16/63
CHECKED 1/17/63
APPROVAL 28 JAN 63
APPROVAL 28 Jan 63
NASA APPROVAL 1-30-63
MIT APPROVAL 30 Jan 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

HEADER ASSEMBLY
ERASABLE MEMORY STICK

CODE IDENT NO. SIZE D NASA DRAWING NO. 1003077
SCALE 2/1 WT SHEET 1 OF 1

1003077

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

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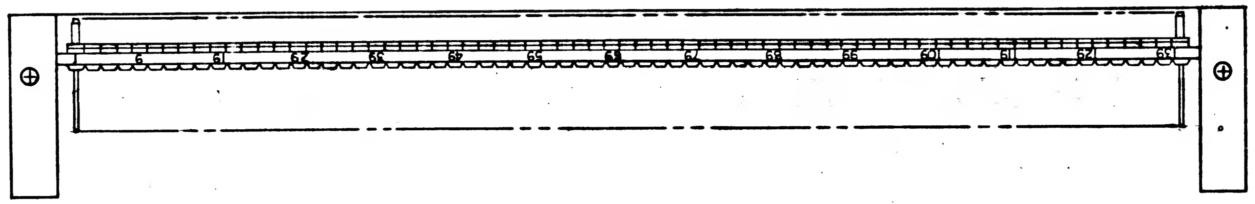
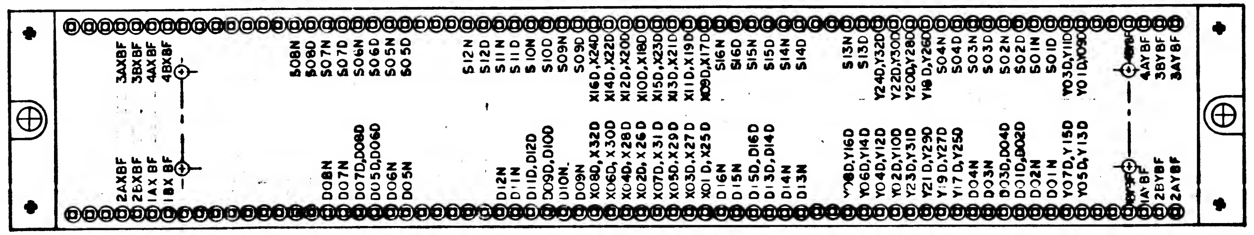
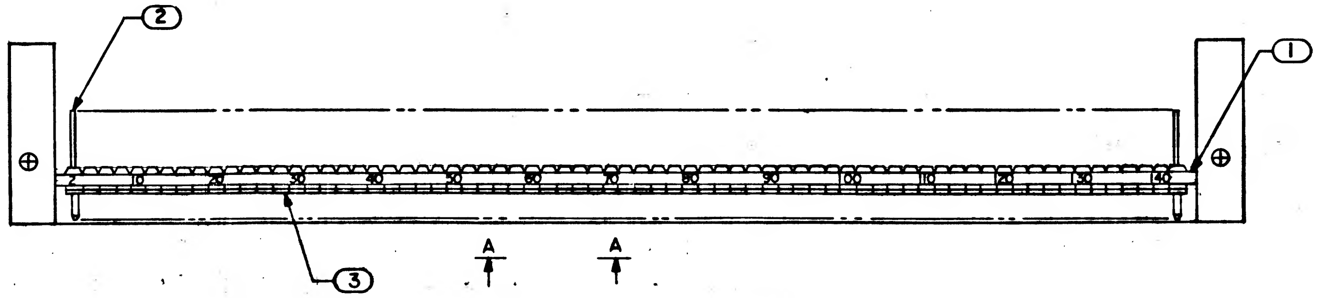
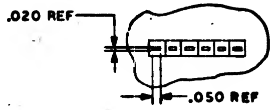
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
E	REPLACES REV D WITH CHANGES PER TDRR 64155	10-24-68	WK









VIEW A-A

Ⓔ REPLACES REV D WITH CHANGES

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. INSTALL FIND NO. 2 AND FIND NO. 3 IN FIND NO. 1 PER ND 1002136
3. MARK WHITE CHARACTERS AS SHOWN PER ND 1002019 (REF SILK SCREEN MASTER DWG 1004089)

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
142	1006775	INSULATOR WRAPOST MALE (MIN)	3
142	1006782-2	CONTACT WRAPOST MALE (MIN)	2
1	1003101	HEADER	

LIST OF MATERIALS

NEXT ASSY	USED ON
1003068	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

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CAMBRIDGE, MASS
DWG NO. CONTRACT
DRAWN A. Di Leo DATE 18 OCT 68
CHECKED 23 OCT 68
APPROVAL 24 OCT 68
APPROVAL
NASA APPROVAL
MIT APPROVAL 24 OCT 68

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

HEADER ASSEMBLY
ERASABLE MEMORY MODULE

CODE IDENT NO. | SIZE E | NASA DRAWING NO 1003077
SCALE 2/1 | WT | SHEET 1 OF 1

1003077 E

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

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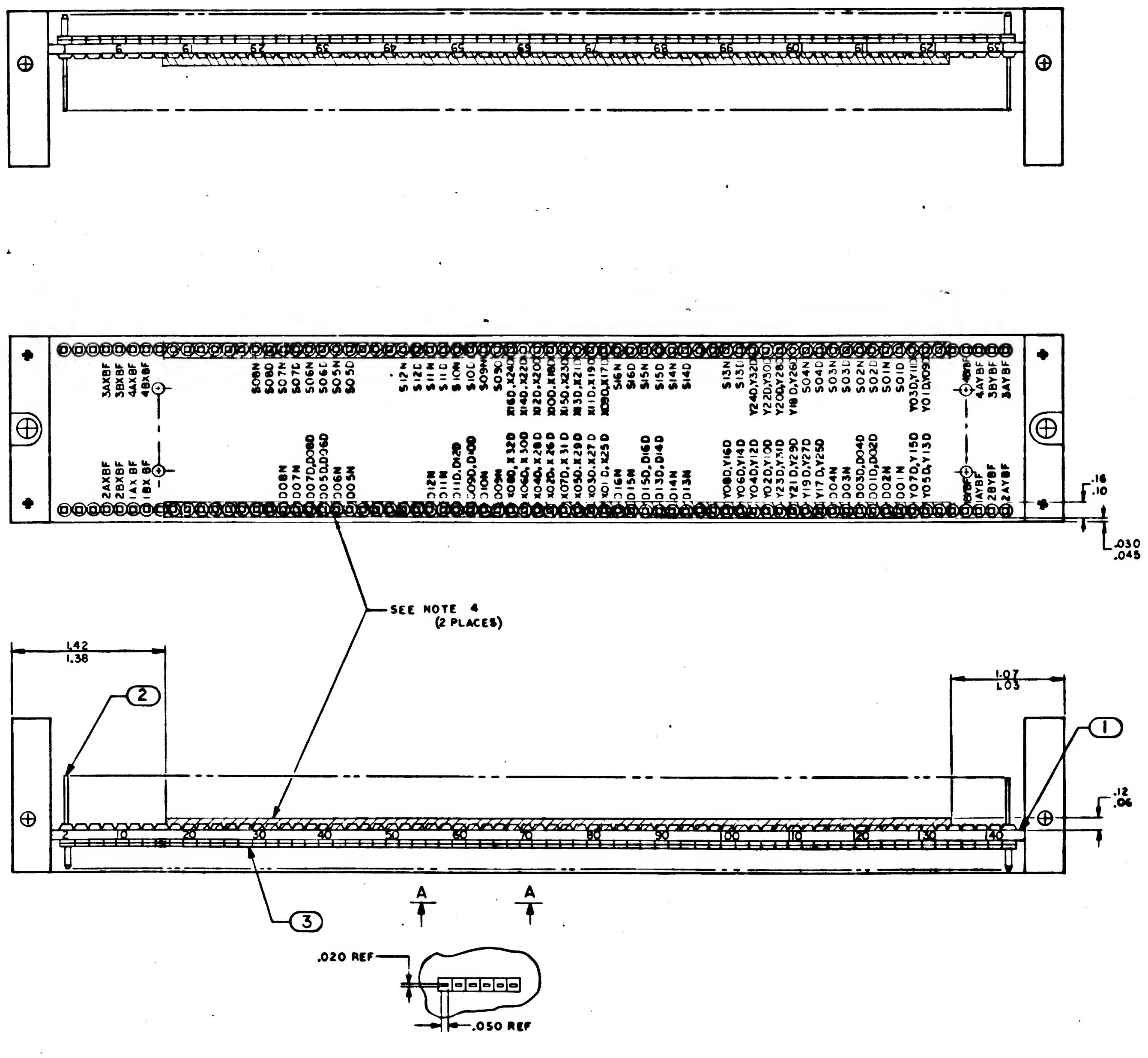
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
E	REPLACES REV D WITH CHANGES PER TDRR 04158		
F	REVISED PER TDRR 08103 DR RalDuPont. CHK R.F.E.	4/30/6	



VIEW A-A

Ⓔ REPLACES REV D WITH CHANGES

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. INSTALL FIND NO. 2 AND FIND NO. 3 IN FIND NO. 1 PER ND 1002136
3. MARK WHITE CHARACTERS AS SHOWN PER ND 1002019 (REF SILK SCREEN MASTER DWG 1004089)
4. BONDING MATERIAL TO BE APPLIED TO INDICATED AREAS PER ND 1002004 USING TYPE II SEMI-RIGID MATERIAL (BLACK) PINS TO BE FREE FROM BONDING MATERIAL BEYOND INDICATED DIMENSIONS

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
142	1006775	INSULATOR WRAPOST MALE (MIN)	3
142	1006782-2	CONTACT WRAPOST MALE (MIN)	2
1	1003101	HEADER	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003068	1003069

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
CONTRACT

DRAWN A. D. Lee DATE 18 OCT 61
CHECKED
APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

HEADER ASSEMBLY
ERASABLE MEMORY MODULE

CODE IDENT NO. —
SIZE E
NASA DRAWING NO 1003077
SCALE 2/1
WT
SHEET 1 OF 1

1003077 F

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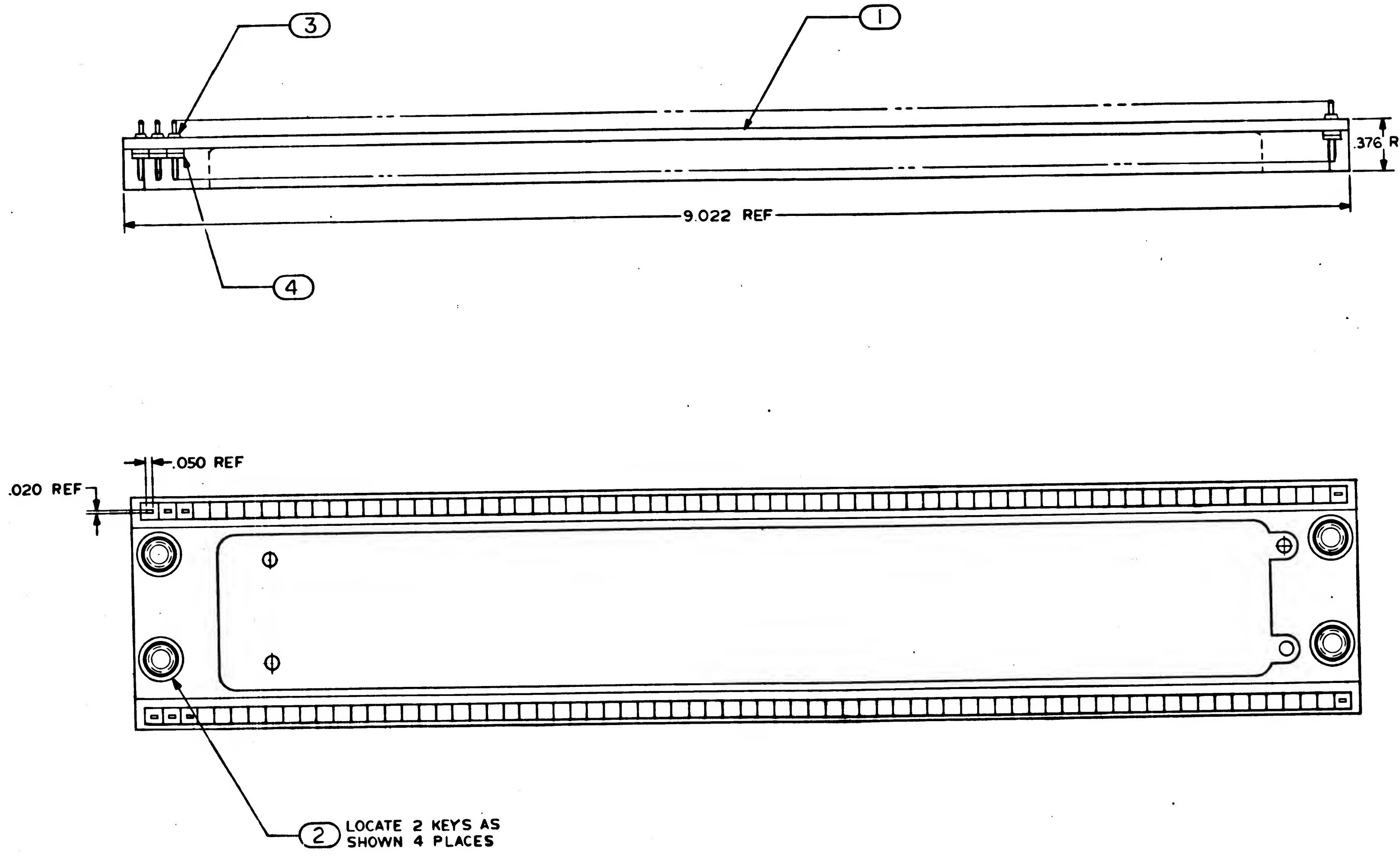
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER TDRR 00394	2-8-63	
B	REVISED PER TDRR 00680	3-27-63	



LOCATE 2 KEYS AS SHOWN 4 PLACES

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00309 DATE 30 Jan 1963

NOTES:—
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. COAT THREADS AND FIND NO 2 PER MIL-P-8585 WET ZINC CHROMATE PRIMER
3. INSTALL FIND NO 2 PER (LATER)

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
142	1006775	INSULATOR WRAPOST MALE (MIN)	4
142	1006782-2	CONTACT WRAPOST MALE (MIN)	3
4	NAS 1394C-08L	KEENSERT KN	2
1	1004096	HEADER, REWORK	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003066	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS . ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT

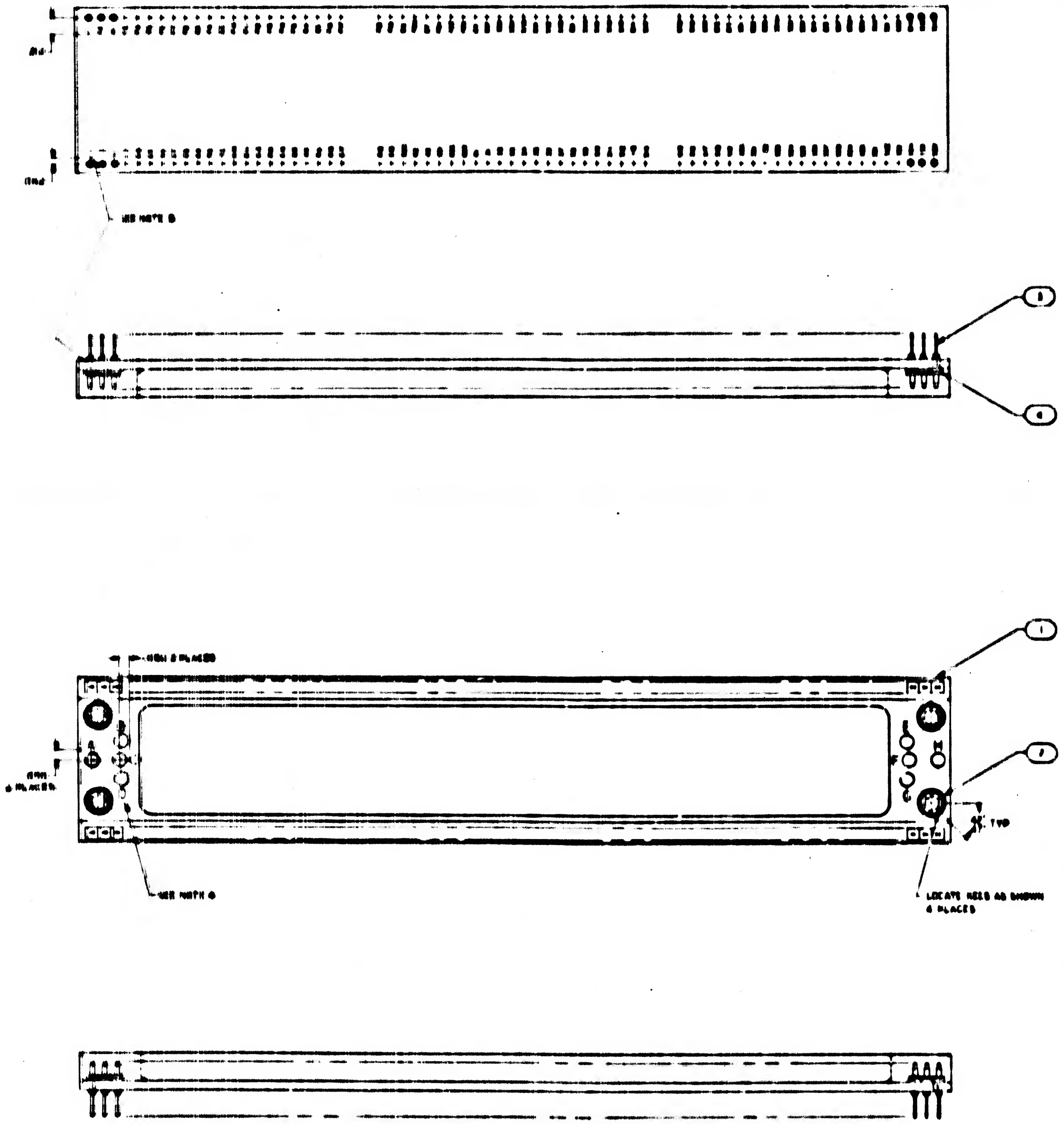
DRAWN Bonaccorso DATE 1/16/63
CHECKED 1/17/63
APPROVAL 28 JAN 63
APPROVAL 28 Jan 63
NASA APPROVAL 1-30-63
MIT APPROVAL 30 Jan 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

HEADER ASSEMBLY
ERASABLE MEMORY STICK

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003077
SCALE 2/1
WT
SHEET 1 OF 1

D 1003077 B



FOR INFORMATION ONLY

CLASS B RELEASE TDRR No. [illegible] DATE [illegible]

NOTES:

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]

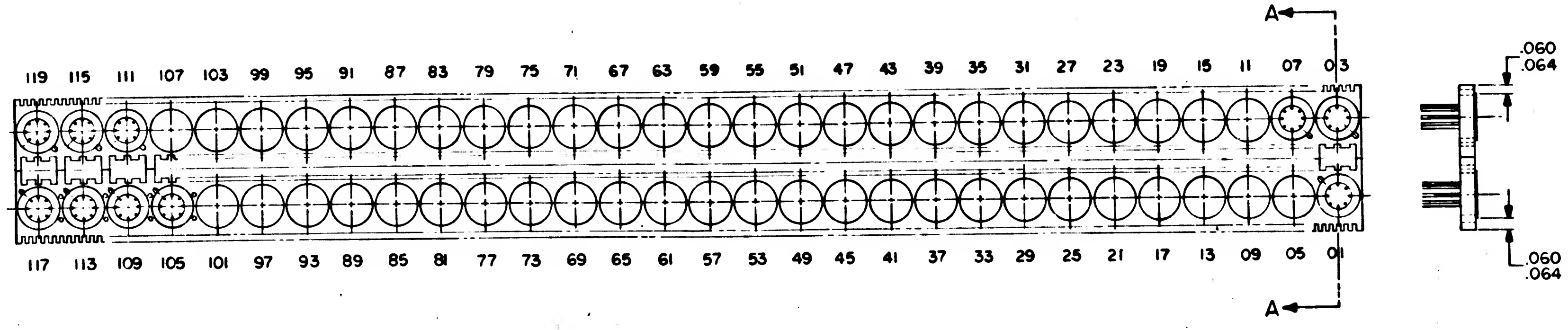
HEADER ASSEMBLY
ROPE MEMORY STACK

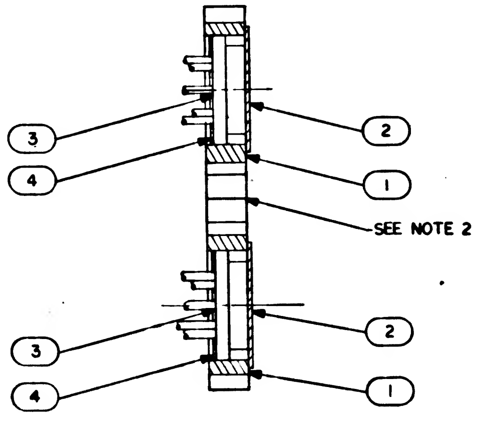
E [illegible]

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

(M)

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00902	16 APR 63	WBT WK





SECTION A-A
SCALE 5/1

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. BOND HOUSINGS PER ND 1002004 ORIENTING AS SHOWN

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1004098	WASHER, MYLAR	4
SEE SH 2	1006771	MICRO NOR GATE (TO-47)	3
2	1004099	STRIP, BACKING	2
2	1004095	HOUSING MICRO LOGIC TO-47	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003081	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO.
CONTRACT
DRAWN [illegible] DATE 2/25/63
CHECKED [illegible] 3/5/63
APPROVAL WB Turner 3/5/63
APPROVAL [illegible]
NASA APPROVAL [illegible]
MIT APPROVAL [illegible] 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(ODD)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003079
SCALE 2:1
WT
SHEET 1 OF 2

1003079 A

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

(M)

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED AND UPGRADED TO CLASS A PER TDRR 00902	16 APR 63	WBT WK

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QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON
1003081	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN DATE 2/26/63
CHECKED 3/5/63
APPROVAL WB 3/5/63
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO 47 HOUSING
SUB - ASSEMBLY
(ODD)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003079
SCALE —
WT
SHEET 2 OF 2

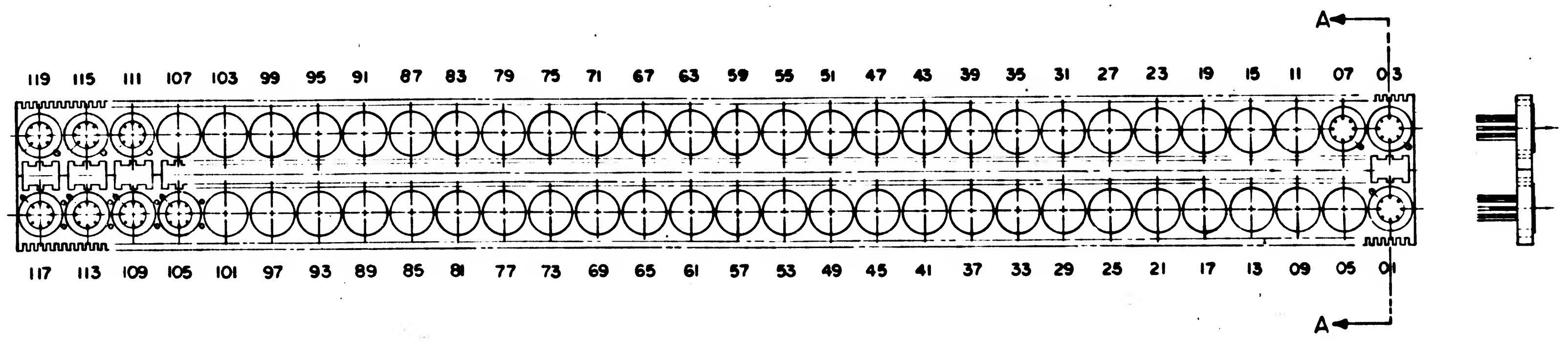
1003079 A

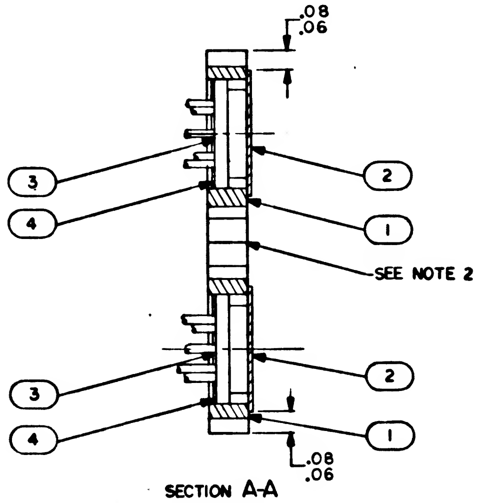
MASTER

INCHES
0 2
PHOTOGRAPHIC SCALE ONLY

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00902	16 [illegible]	NBT WK
B	REVISED PER TDRR 1631	6/19/63	EK [illegible]





SECTION A-A
SCALE 5/1

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. BOND HOUSINGS PER ND 1002004 ORIENTING AS SHOWN
3. AR DENOTES AS REQUIRED QUANTITY
4. ☒ IN TABLE SIGNIFIES FIND NO. 3 TO BE OMITTED IN THIS POSITION

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1004098	WASHER, MYLAR	4
SEE SH 2	1006771	MICRO NOR GATE (TO-47)	3
AR	1006826-3	INSULATION, TAPE ELECTRICAL	2
2	1004095	HOUSING MICRO LOGIC TO-47	1

LIST OF MATERIALS

1003081	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
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MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO.
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CHECKED [illegible] 3/5/63
APPROVAL W B [illegible] 3/5/63
APPROVAL [illegible]
NASA APPROVAL [illegible]
MIT APPROVAL [illegible] 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(ODD)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003079
SCALE 2:1
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SHEET 1 OF 2

1003079 B

MASTER

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PHOTOGRAPHIC SCALE ONLY

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED AND UPGRADED TO CLASS A PER TDRR 00902	APR 63	WBT WK
B	REVISED PER TDRR 1631		

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QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
LIST OF MATERIALS			

MASTER

1003081	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG NO. CONTRACT

DRAWN DATE 2/26/63
CHECKED 3/5/63
APPROVAL W.B. Turner 3/5/63
APPROVAL
NASA APPROVAL
MIT APPROVAL 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO 47 HOUSING
SUB-ASSEMBLY
(ODD)

CODE IDENT NO.	SIZE	NASA DRAWING NO.
	D	1003079
SCALE —	WT	SHEET 2 OF 2

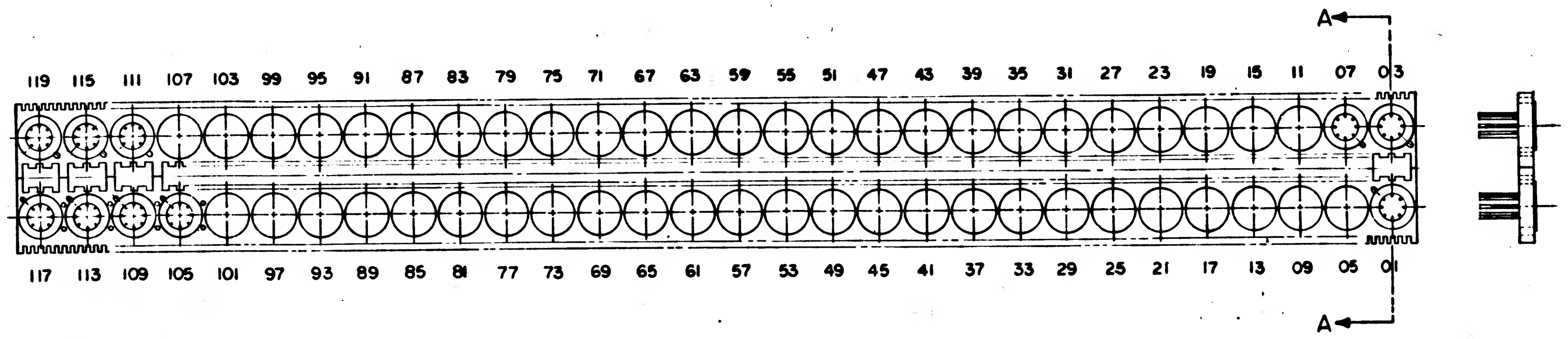
1003079 B

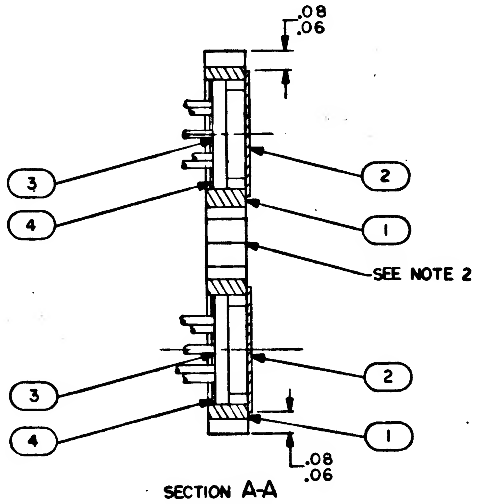
INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS

SYM	DESCRIPTION TDRR 00519	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00902	16 APR 63	NBT WK
B	REVISED PER TDRR 1631	6/19/63	
C	REVISED PER TDRR 01852	7/2/63	





SECTION A-A
SCALE 5/1

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. BOND HOUSINGS PER ND 1002004 ORIENTING AS SHOWN
3. AR DENOTES AS REQUIRED QUANTITY
4. ☒ IN TABLE SIGNIFIES FIND NO. 3 TO BE OMITTED IN THIS POSITION

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1004098	WASHER, MYLAR	4
SEE SH 2	1006771	MICRO NOR GATE (TO-47)	3
AR	1006826-3	INSULATION, TAPE ELECTRICAL	2
2	1004095	HOUSING MICRO LOGIC TO-47	1

LIST OF MATERIALS

1003081	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

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INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT

DRAWN DATE 2/25/63
CHECKED 3/ /63
APPROVAL W B Turner 3/5/63
APPROVAL
NASA APPROVAL
MIT APPROVAL 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(ODD)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003079
SCALE 2:1
WT
SHEET 1 OF 2

1003079 C

MASTER

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

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REVISIONS			
SYM	DESCRIPTION TDRR 00514	DATE	APPROVAL
A	REVISED AND UPGRADED TO CLASS A PER TDRR 00902	[illegible] 63	[illegible]
B	REVISED PER TDRR 1631	[illegible]	[illegible]
C	REVISED PER TDRR 01852	7/2/[illegible]	[illegible]

LOGIC MODULE NO.		A1-16	A17	A18	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30-31	A32	A33-34	A35	A36	A37	A38					
PART NO. 1003079		-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19					
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QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
LIST OF MATERIALS			

MASTER

NEXT ASSY	USED ON
1003081	
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

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INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO.
CONTRACT
DRAWN DATE 2/26/63
CHECKED 3/6/63
APPROVAL 3/5/63
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO 47 HOUSING
SUB-ASSEMBLY
(ODD)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003079
SCALE —
WT
SHEET 2 OF 2

1003079 C

INCHES
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PHOTOGRAPHIC SCALE ONLY

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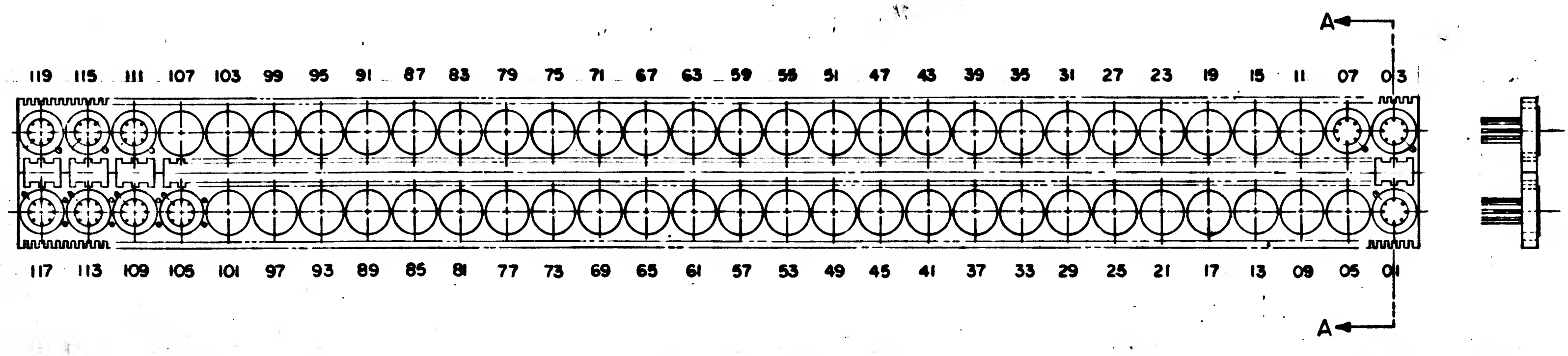
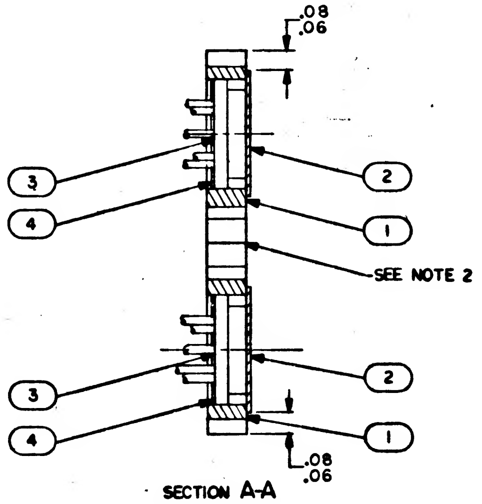
REVISIONS

SYM	DESCRIPTION TDRR 00514	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00902	16 APR 63	NBT WK
B.	REVISED PER TDRR 1631	6/19/63	[illegible]
C	REVISED PER TDRR 01852	7/2/63	[illegible]
D	REVISED PER TDRR 02284	7/26/63	[illegible]





SECTION A-A
SCALE 5/1

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. BOND HOUSINGS PER ND 1002004 ORIENTING AS SHOWN
3. AR DENOTES AS REQUIRED QUANTITY
4. ☒ IN TABLE SIGNIFIES FIND NO. 3 TO BE OMITTED IN THIS POSITION

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1004098	WASHER, MYLAR	4
SEE SH 2	1006771	MICRO NOR GATE (TO-47)	3
AR	1006826-3	INSULATION, TAPE ELECTRICAL	2
2	1004095	HOUSING MICRO LOGIC TO-47	1

LIST OF MATERIALS

MASTER

1003081	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± —
DECIMALS ± —
ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO.
CONTRACT
DRAWN [illegible] DATE 2/25/63
CHECKED [illegible] 3/4/63
APPROVAL WNB Turner 3/5/63
APPROVAL [illegible]
NASA APPROVAL [illegible]
MIT APPROVAL WKaffer 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING SUB-ASSEMBLY (ODD)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003079
SCALE 2/1
WT
SHEET 1 OF 2

1003079 D

INCHES
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PHOTOGRAPHIC SCALE ONLY

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REVISIONS			
SYM	DESCRIPTION TDRR 00514	DATE	APPROVAL
A	REVISED AND UPGRADED TO CLASS A PER TDRR 00902	6 MAR 63	WBT
B	REVISED PER TDRR 1631		
C	REVISED PER TDRR 01852	7/2/	
D	REVISED PER TDRR 02284	7/26/63	WBT 7/31

LOGIC MODULE NO.	A1-16	A17	A18	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30-31	A32	A33-34	A35	A36	A37	A38					
PART NO. 1003079-	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19					
POSITION NO. (SEE NOTE 4)																								
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TOTAL TO47 PER THIS ASSY	60	55	55	56	59		54				52		59		57				59					

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

MASTER

1003081	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN DATE 2/26/63
CHECKED 3/5/63
APPROVAL 3/5/63
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO 47 HOUSING
SUB-ASSEMBLY
(ODD)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003079
SCALE —
WT
SHEET 2 OF 2

1003079 D

INCHES
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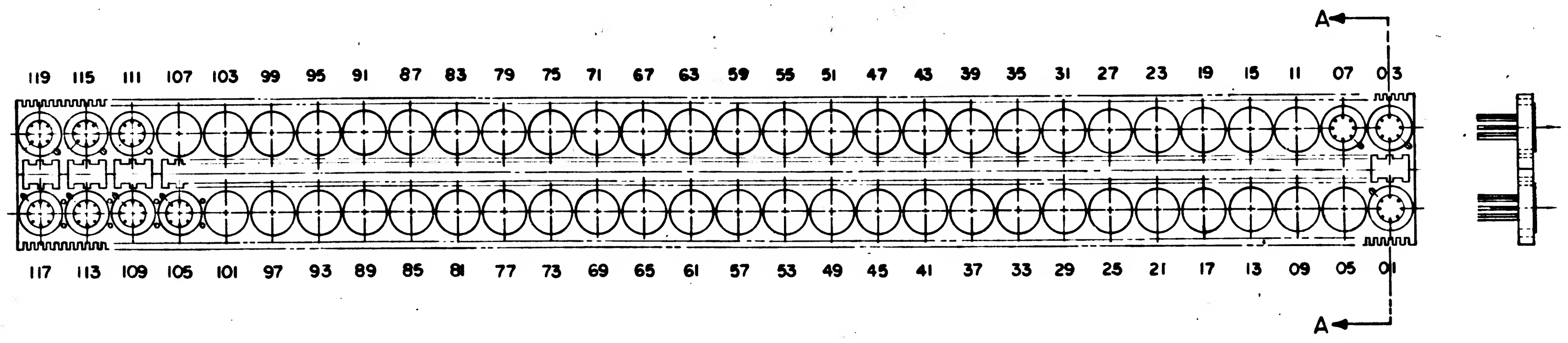
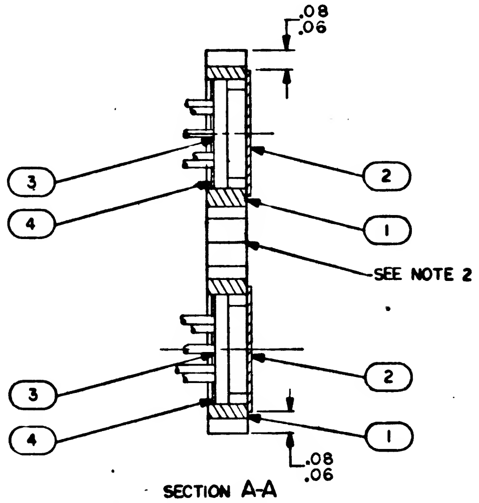
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS

SYM	DESCRIPTION TDRC 00519	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00902	16 APR 63	NBT WK
B	REVISED PER TDRR 1631	6/19/63	EPK
C	REVISED PER TDRR 01852	7/2/63	
D	REVISED PER TDRR 02284	7/24/63	NBT
E	REVISED PER TDRR 03046	10/4/63	NBT WK





SECTION A-A
SCALE 5/1

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. BOND HOUSINGS PER ND 1002004 ORIENTING AS SHOWN
3. AR DENOTES AS REQUIRED QUANTITY
4. ☒ IN TABLE SIGNIFIES FIND NO. 3 TO BE OMITTED IN THIS POSITION

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1004098	WASHER, MYLAR	4
SEE SH 2	1006771	MICRO NOR GATE (TO-47)	3
AR	1006826-3	INSULATION, TAPE ELECTRICAL	2
2	1004095	HOUSING MICRO LOGIC TO-47	1

LIST OF MATERIALS

MASTER

1003081	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN DATE 2/25/63
CHECKED 3/1/63
APPROVAL W. P. Turner 3/5/63
APPROVAL
NASA APPROVAL
MIT APPROVAL 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(ODD) (TABULATED)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003079
SCALE 2:1
WT
SHEET 1 OF 2

1003079 E

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS

SYM	DESCRIPTION TDRR 00514	DATE	APPROVAL
A	REVISED AND UPGRADED TO CLASS A PER TDRR 00902	16 APR 63	WBT WK
B	REVISED PER TDRR 1631	[illegible]	[illegible]
C	REVISED PER TDRR 01832	7/2/[illegible]	[illegible]
D	REVISED PER TDRR 02284	7/26/63	WBT 7/31
E	REVISED PER TDRR D3046	[illegible]	WBT EDK WK

PART NO. 1003079	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19					
REVISION	—	—	—	—	—		—				—		—		—				—					
POSITION NO. (SEE NOTE 4)																								
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03						X								X					X					
05								X																
07																								
09			X			X	X					X												
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97											X													
99							X																	
101											X													
103														X			X							
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107						X																		
109			X				X				X			X		X								
111																								
113				X							X			X										
115																								
117											X			X										
119				X										X										
TOTAL TO47 PER THIS ASSY	60	55	55	56	59	41	54	59	58	60	52	55	59	52	57	59	57	59	59					

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

MASTER.

1003081	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO.
CONTRACT
DRAWN DATE 2/26/63
CHECKED 3/6/63
APPROVAL W.B. Turner 3/5/63
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO 47 HOUSING
SUB-ASSEMBLY
(ODD) (TABULATED)

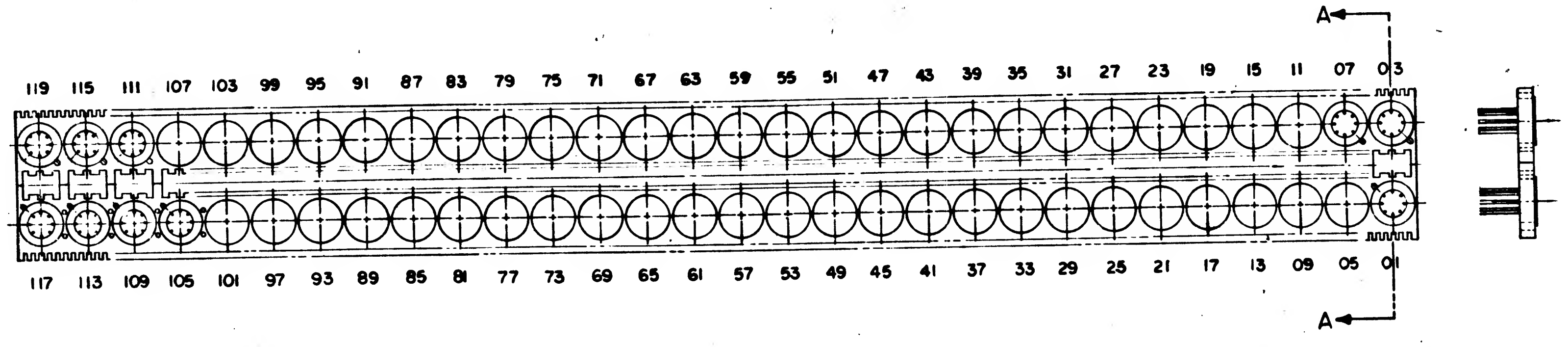
CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003079
SCALE —
WT
SHEET 2 OF 2

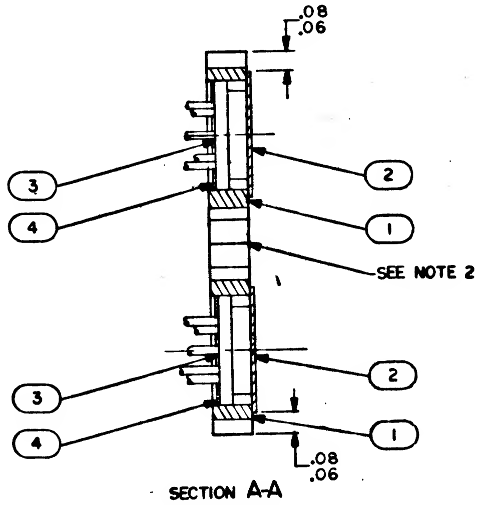
1003079 E

INCHES
0 2
PHOTOGRAPHIC SCALE ONLY

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION TDRC 00519	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00902	16 APR 63	WBT WK
B	REVISED PER TDRR 1631	6/19/63	[illegible]
C	REVISED PER TDRR 01852	7/2/63	[illegible]
D	REVISED PER TDRR 02284	7/26/63	WBT [illegible]
E	REVISED PER TDRR 03046	10/4/63	WBT WK
F	REVISED PER TDRR 03591	10-3-63	WK





SECTION A-A
SCALE 5/1

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. BOND HOUSINGS PER ND 1002004 ORIENTING AS SHOWN
3. AR DENOTES AS REQUIRED QUANTITY
4. ☒ IN TABLE SIGNIFIES FIND NO. 3 TO BE OMITTED IN THIS POSITION

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1004098	WASHER, MYLAR	4
SEE SH 2	1006771	MICRO NOR GATE (TO-47)	3
AR	1006826-3	INSULATION, TAPE ELECTRICAL	2
2	1004095	HOUSING MICRO LOGIC TO-47	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003081	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO.
CONTRACT
DRAWN [illegible] DATE 2/25/63
CHECKED [illegible] 3/5/63
APPROVAL WB Turner 3/5/63
APPROVAL [illegible]
NASA APPROVAL [illegible]
MIT APPROVAL [illegible] 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(ODD) (TABULATED)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003079
SCALE 2:1
WT
SHEET 1 OF 2

1003079
F

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION TDRR 00514	DATE	APPROVAL
A	REVISED AND UPGRADED TO CLASS A PER TDRR 00902	K APR 63	WBT WK
B	REVISED PER TDRR 1631		K.E.K.
C	REVISED PER TDRR 01852	7/2/63	
D	REVISED PER TDRR 02284	7/26/63	WBT 7/31
E	REVISED PER TDRR D3046		WBT EDK WK
F	REVISED PER TDRR 03591	12-3-63	WK

MODULE NO.		A1-A16	A17	A18	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30 A31	A32	A33 A34	A35	A36	A37	A38	A36	A28			
PART NO. 1003079		-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21			
REVISION		—	—	—	—	—		—				—		—		—'				—	F	F			
POSITION NO. (SEE NOTE 4)	01						X								X										
	03						X								X					X					
	05								X																
	07																								
	09			X			X	X					X												
	11						X																		
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TOTAL TO47 PER THIS ASSY		60	55	55	56	59	41	54	59	58	60	52	55	59	52	57	59	57	59	59	56	53			

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

MASTER

1003081	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN DATE 2/26/63
CHECKED 3/5/63
APPROVAL W.B. Turner 3/5/63
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO 47 HOUSING SUB-ASSEMBLY
(ODD) (TABULATED)

CODE IDENT NO. SIZE D NASA DRAWING NO. 1003079
SCALE — WT SHEET 2 OF 2

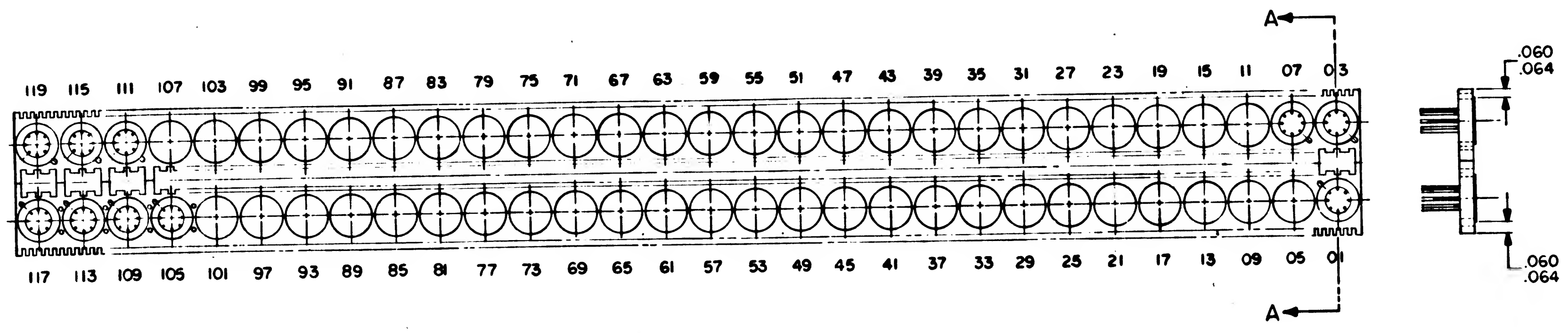
65

1003079 E

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

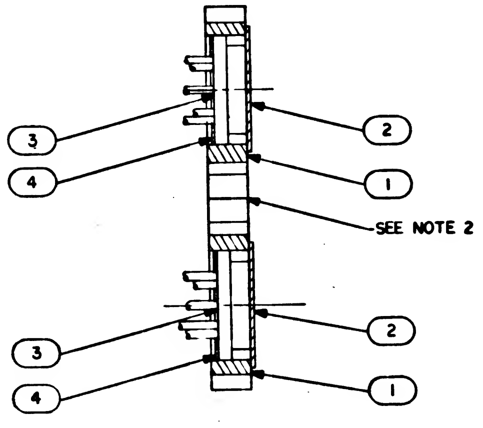
SYM	DESCRIPTION	DATE	APPROVAL

REVISIONS



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00514 DATE 6 Mar 63



SECTION A-A
SCALE 5/1

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. BOND HOUSINGS PER ND 1002004 ORIENTING AS SHOWN
3. BOND FIND NO.2 TO FIND NO.1 PER ND 1002004
4. BOND FIND NO.3 TO FIND NO.2 PER ND 1002004
5. BOND FIND NO.4 TO FIND NO.3 PER ND 1002004

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1004098	WASHER, MYLAR	4
	1006771	MICRO NOR GATE (TO-47)	3
2	1004099	STRIP, BACKING	2
2	1004095	HOUSING MICRO LOGIC TO-47	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003081	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT
DRAWN [illegible] DATE 2/25/63
CHECKED [illegible] 3/5/63
APPROVAL W B Turner 3/5/63
APPROVAL [illegible]
NASA APPROVAL [illegible]
MIT APPROVAL [illegible] 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(ODD)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003079
SCALE 2:1
WT
SHEET 1 OF 2

1003079

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

PIN CO-OD NO.	STICK NUMBER:																						
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FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00514 DATE 6 Mar 63

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
LIST OF MATERIALS			

1003081	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT
DRAWN DATE 2/26/63
CHECKED 3/5/63
APPROVAL W B 3/5/63
APPROVAL 3/6/63
NASA APPROVAL
MIT APPROVAL 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO 47 HOUSING
SUB-ASSEMBLY
(ODD)

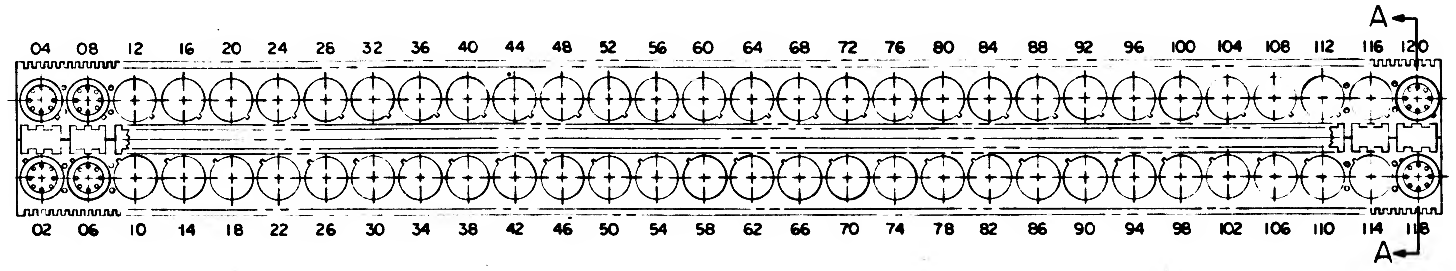
CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003079
SCALE —
WT
SHEET 2 OF 2

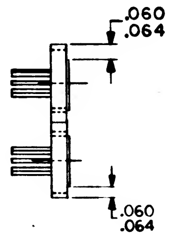
1003079

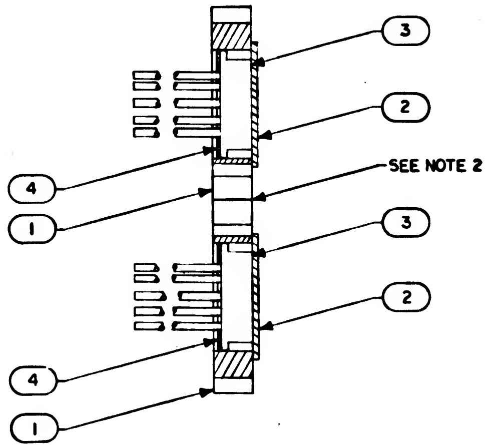
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00903	15 APR 63	WET WK







SECTION A-A
SCALE 5:1

NOTES
1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. BOND HOUSINGS PER ND1002004 ORIENTING AS SHOWN

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1004098	WASHER, MYLAR	4
SEE SW 2	1006771	MICRO, NOR GATE (TO 47)	3
2	1004099	STRIP, BACKING	2
2	1004095	HOUSING, MICRO LOGIC (TO 47)	1

LIST OF MATERIALS

MASTER

NEXT ASSY	USED ON
1003082	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO.
CONTRACT
DRAWN DATE 26 Feb 63
CHECKED 3/5/63
APPROVAL 3/5/63
APPROVAL 3/6/63
NASA APPROVAL Jack Barnes
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(EVEN)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003080
SCALE 2:1
WT
SHEET 1 OF 2

1003080 A

INCHES
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PHOTOGRAPHIC SCALE ONLY

NOTICE — WHEN GOVERNMENT DRAWINGS SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED FURNISHED OR IN ANY WAY SUPPLIED THE SAID DRAWINGS SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE USE OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00903	16 APR 63	WBT WK

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QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

1003082	
NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± -- DECIMALS ± -- ANGLES ± --
DO NOT SCALE THIS DRAWING

MATERIAL

HEAT TREATMENT

FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT

DRAWN Tom Gilligan DATE 26 FEB 63
CHECKED 3/5/63
APPROVAL WB Turner 3/5/63
APPROVAL Duggan 3/6/63
NASA APPROVAL Jack Barnard
MIT APPROVAL 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(EVEN)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003080
SCALE --
WT
SHEET 2 OF 2

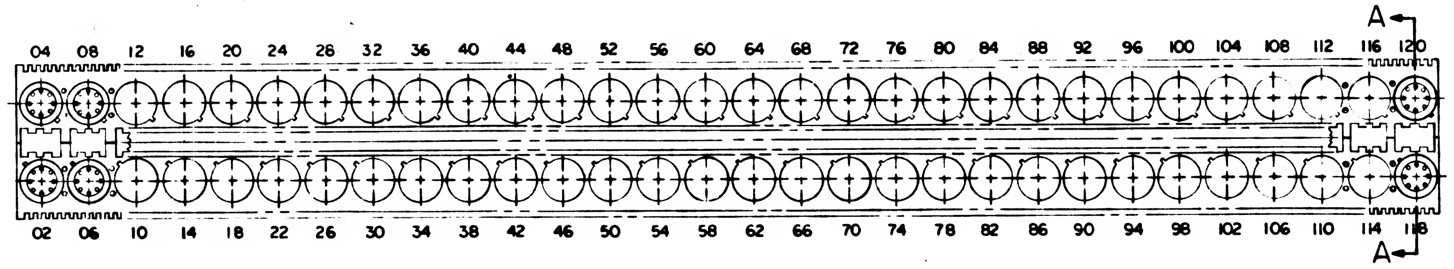
1003080 A

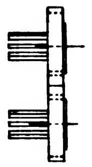
MASTER

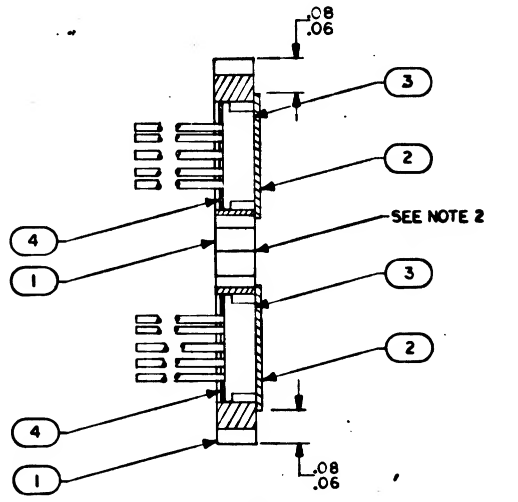
INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED & UPGRADED TO CLASS A PER TDRR 00903	6 APR 63	WBT WK
B	REVISED PER TDRR 1631	4/10/63	







SECTION A-A
SCALE 5:1

NOTES
1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. BOND HOUSINGS PER ND1002004 ORIENTING AS SHOWN
3. AR DENOTES AS REQUIRED QUANTITY
4. ☒ IN TABLE SIGNIFIES FIND NO. 3 TO BE OMITTED IN THIS POSITION

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1004098	WASHER, MYLAR	4
SEE SHT 2	1006771	MICRO, NOR GATE (TO 47)	3
2	1006826-3	INSULATION TAPE, ELECTRICAL	2
2	1004095	HOUSING, MICRO LOGIC (TO 47)	1

LIST OF MATERIALS

1003082	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO. CONTRACT
DRAWN DATE 26 Feb 63
CHECKED 3/5/63
APPROVAL 3/5/63
APPROVAL 3/6/63
NASA APPROVAL Jack Barnes
MIT APPROVAL 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(EVEN)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003080
SCALE 2:1
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SHEET 1 OF 2

MASTER

1003080 B

INCHES
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PHOTOGRAPHIC SCALE ONLY

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00903	16 Apr 63	WBT WK
B	REVISED PER TDRR 1631	4/19/63	RDK

POSITION NO. (SEE NOTE 4)

LOGIC MODULE NO.																								
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TOTAL TO 47 THIS ASSY	58																							

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

MASTER

NEXT ASSY	USED ON
1003082	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG NO. CONTRACT

DRAWN Tom Gilligan DATE 26 FEB 63
CHECKED 3/5/63
APPROVAL W B Turner 3/5/63
APPROVAL 3/6/63
NASA APPROVAL
MIT APPROVAL 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(EVEN)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003080
SCALE —
WT
SHEET 2 OF 2

1003080 B

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

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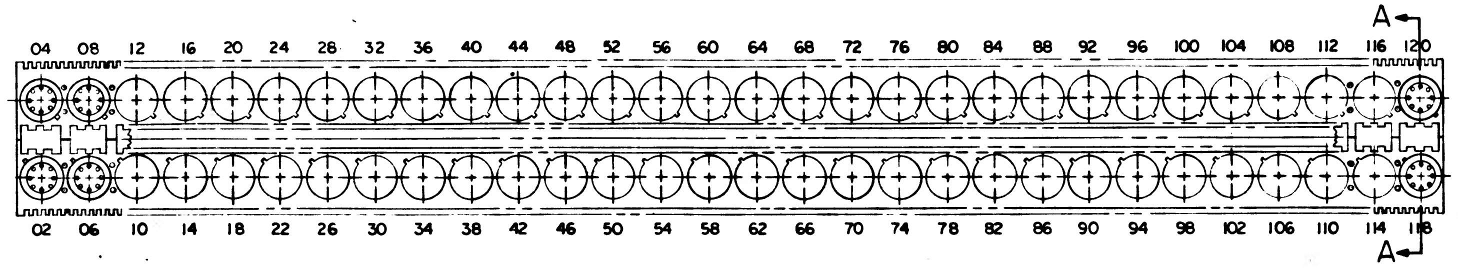
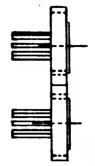
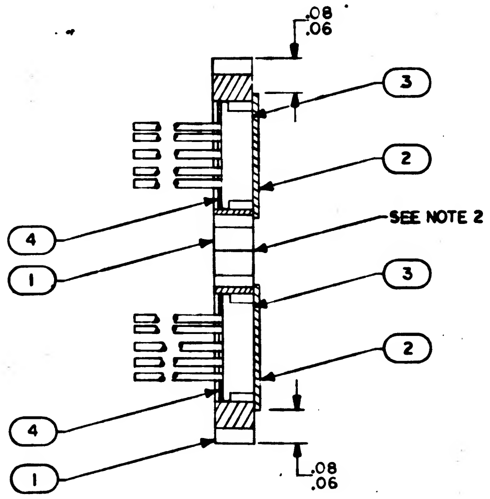
REVISIONS TDRR 60514 "B"

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00903	16 APR 63	WBT WK
B	REVISED PER TDRR /631	6/19/63	
C	REVISED PER TDRR 61851	7/2/63	







SECTION A-A
SCALE 5:1

NOTES
1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. BOND HOUSINGS PER ND1002004 ORIENTING AS SHOWN
3. AR DENOTES AS REQUIRED QUANTITY
4. ☒ IN TABLE SIGNIFIES FIND NO. 3 TO BE OMITTED IN THIS POSITION

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1004098	WASHER, MYLAR	4
SEE TAB 2	1006771	MICRO, NOR GATE (TO 47)	3
2	1006826-3	INSULATION TAPE, ELECTRICAL	2
2	1004095	HOUSING, MICRO LOGIC (TO 47)	1

LIST OF MATERIALS

MASTER

NEXT ASSY	USED ON
1003082	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
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MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN DATE 26 Feb 63
CHECKED 3/4/63
APPROVAL 3/5/63
APPROVAL 3/4/63
NASA APPROVAL Jack Barnes
MIT APPROVAL 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(EVEN)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003080
SCALE 2:1
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SHEET 1 OF 2

1003080 C

INCHES
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PHOTOGRAPHIC SCALE ONLY

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REVISIONS TDRR 00514 "B"

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00903	16 APR 63	WBT WK
B	REVISED PER TDRR 1631	4/19/63	RPK
C	REVISED PER TDRR 01851	7/2/63	RPK

POSITION NO. (SEE NOTE 4)

LOGIC MODULE NO.	A1-16	A17	A18	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30-31	A32	A33-34	A35	A36	A37	A38					
PART NO. 1003080	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19					
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TOTAL TO 47 THIS ASSY	56	60											58		59				56					

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
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FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
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HEAT TREATMENT
FINAL FINISH

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INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT

DRAWN DATE 26 FEB 63
CHECKED 3/5/63
APPROVAL W B Turner 3/5/63
APPROVAL 3/6/63
NASA APPROVAL
MIT APPROVAL 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(EVEN)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003080
SCALE —
WT
SHEET 2 OF 2

INCHES
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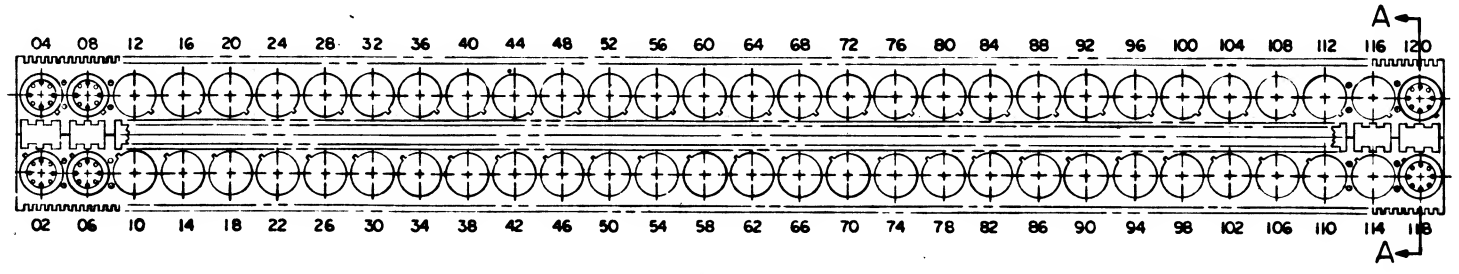
PHOTOGRAPHIC SCALE ONLY

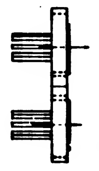
1003080 C

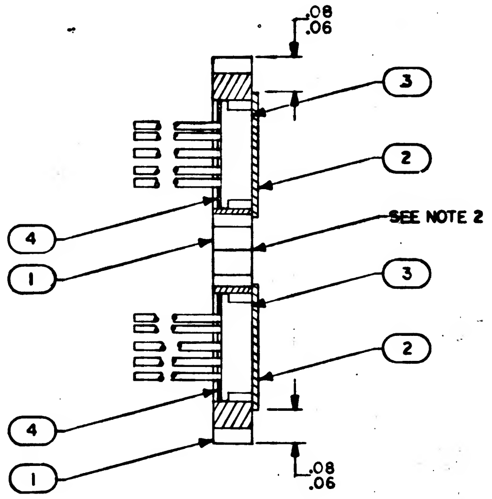
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS TDRR 00514 "B"

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00903	16 APR 63	WBT WK
B	REVISED PER TDRR 1631	6/19/63	RPK T.F.K.
C	REVISED PER TDRR 01851	7/8/63	RDL [illegible]
D	REVISED PER TDRR 02296	11/26/63	WBT [illegible]







SECTION A-A
SCALE 5:1

NOTES

1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. BOND HOUSINGS PER ND1002004 ORIENTING AS SHOWN
3. AR DENOTES AS REQUIRED QUANTITY
4. ☒ IN TABLE SIGNIFIES FIND NO. 3 TO BE OMITTED IN THIS POSITION

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1004098	WASHER, MYLAR	4
SEE SYM 2	1006771	MICRO, NOR GATE (TO 47)	3
2	1006826-3	INSULATION TAPE, ELECTRICAL	2
2	1004095	HOUSING, MICRO LOGIC (TO 47)	1

LIST OF MATERIALS

1003082	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

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INSTRUMENTATION LAB
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DWG. NO. CONTRACT
DRAWN [illegible] DATE 26 Feb 63
CHECKED [illegible] 3/5/63
APPROVAL [illegible] 3/5/63
APPROVAL [illegible]
NASA APPROVAL Jack Barnard
MIT APPROVAL W Kupfer 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(EVEN)

CODE IDENT NO. | SIZE D | NASA DRAWING NO. 1003080
SCALE 2:1 | WT | SHEET 1 OF 2

1003080 D

INCHES
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PHOTOGRAPHIC SCALE ONLY

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REVISIONS TDRR 00514 "B"

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00903	16 APR 63	WBT WK
B	REVISED PER TDRR 1631	6/19/63	EAK
C	REVISED PER TDRR 0185	7/2/63	EAK
D	REVISED PER TDRR	7/24/63	WBT

POSITION NO. (SEE NOTE 4)

LOGIC MODULE NO.	A1-16	A17	A18	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30-31	A32	A33-34	A35	A36	A37	A38					
PART NO. 1003080	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19					
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116							X																	
118				X									X											
120																								
TOTAL TO 47 THIS ASSY	56	60	50	54	47		52				57		58		59				56					

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

1003082	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO.
CONTRACT

DRAWN Tom DiPugen DATE 26 FEB 63
CHECKED 3/5/63
APPROVAL W B Turner 3/5/63
APPROVAL S Duggan 3/6/63
NASA APPROVAL Jack Barnard
MIT APPROVAL 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(EVEN)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003080
SCALE —
WT
SHEET 2 OF 2

05

INCHES
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PHOTOGRAPHIC SCALE ONLY

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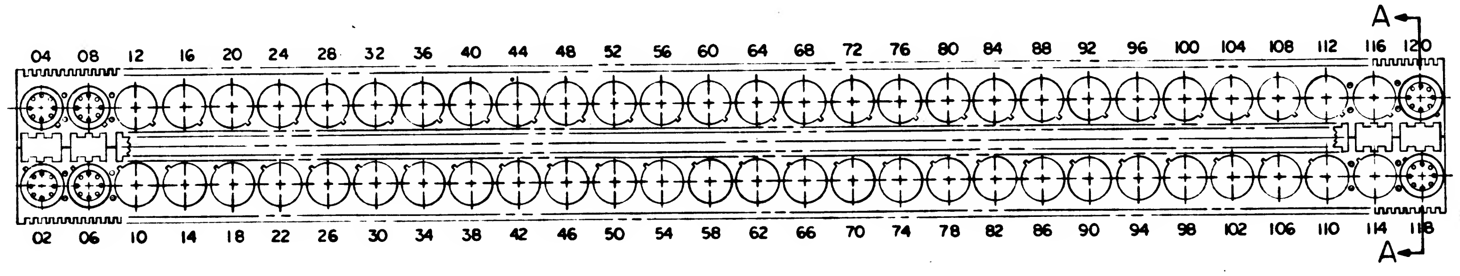
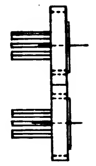
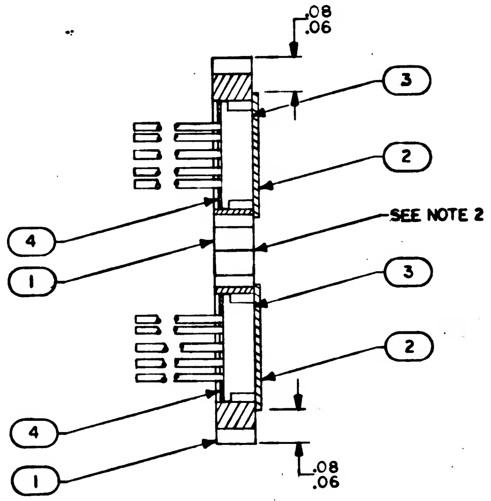
REVISIONS TDRR 00514 "B"

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00903	16 APR 63	WBT WH
B	REVISED PER TDRR 1631	6/10/63	
C	REVISED PER TDRR 01851	7/2/63	
D	REVISED PER TDRR 02296	7/29/63	WBT 7/31
E	REVISED PER TDRR 03048	8-12-63	WBT WK







SECTION A-A
SCALE 5:1

NOTES
1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. BOND HOUSINGS PER ND1002004 ORIENTING AS SHOWN
3. AR DENOTES AS REQUIRED QUANTITY
4. ☒ IN TABLE SIGNIFIES FIND NO. 3 TO BE OMITTED IN THIS POSITION

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1004098	WASHER, MYLAR	4
SEE SW 2	1006771	MICRO, NOR GATE (TO 47)	3
2	1006826-3	INSULATION TAPE, ELECTRICAL	2
2	1004095	HOUSING, MICRO LOGIC (TO 47)	1

LIST OF MATERIALS

MASTER

1003082	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN DATE 26 Feb 63
CHECKED 3/5/63
APPROVAL 3/5/63
APPROVAL
NASA APPROVAL Jack Barnard
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(EVEN) (TABULATED)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003080
SCALE 2:1
WT
SHEET 1 OF 2

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS TDRR 00514 "S"

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00903	16 APR 63	WBT WK
B	REVISED PER TDRR 1631	6/19/63	RPK
C	REVISED PER TDRR 01851	7/2/63	RPK
D	REVISED PER TDRR 01876	7/24/63	WBT
E	REVISED PER TDRR 03048	8-12-63	WBT WK

POSITION NO. (SEE NOTE 4)

PART NO. 1003080	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19
REVISION	—	—	—	—	—		—				—		—		—				—
02											X						X		
04																			
06										X				X					X
08																			
10	X				X	X	X												X
12			X			X													
14			X																X
16	X		X																
18	X					X			X										
20																			
22																			
24																			
26						X													
28																			
30			X	X			X												
32																			
34																			
36																			
38						X										X			X
40						X								X					
42																			
44																			
46						X			X										
48					X						X								
50	X			X		X	X	X											
52																			
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56																			
58																	X		
60			X																
62					X											X			
64																			
66			X					X			X						X		
68															X				
70			X	X	X		X			X									
72																			
74					X												X		
76															X				
78					X														
80																			
82					X														
84									X										
86			X		X		X												
88																			
90					X			X	X										
92																			
94					X														
96						X													
98			X				X												
100																			
102					X														
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106			X		X	X													
108																			
110				X	X		X												
112																			
114				X									X						
116						X	X												
118				X									X						
120																			
TOTAL TO 47 THIS ASSY	56	60	50	54	47	49	52	57	56	58	57	60	58	58	58	58	56	60	56

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL
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FINAL FINISH

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INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT

DRAWN Tom Hilliger DATE 26 FEB 63
CHECKED 3/5/63
APPROVAL W B Turner 3/5/63
APPROVAL 3/6/63
NASA APPROVAL
MIT APPROVAL 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(EVEN) (TABULATED)

CODE IDENT NO. SIZE D NASA DRAWING NO. 1003080
SCALE — WT SHEET 2 OF 2

MASTER

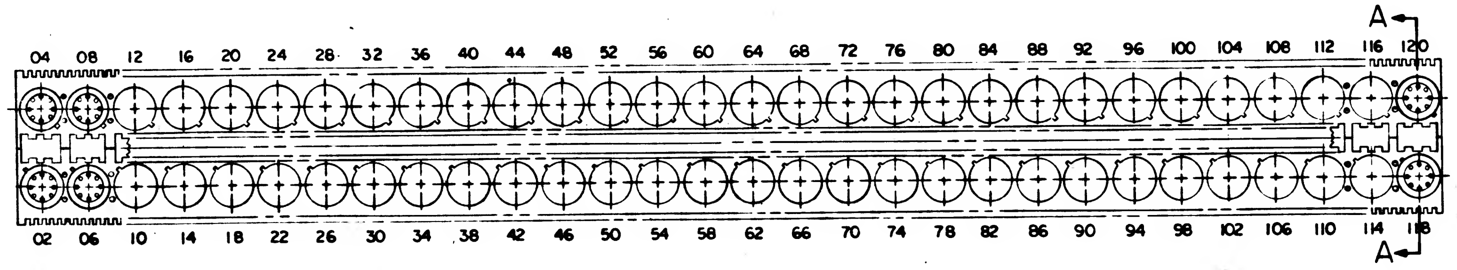
INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

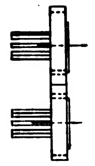
1003080

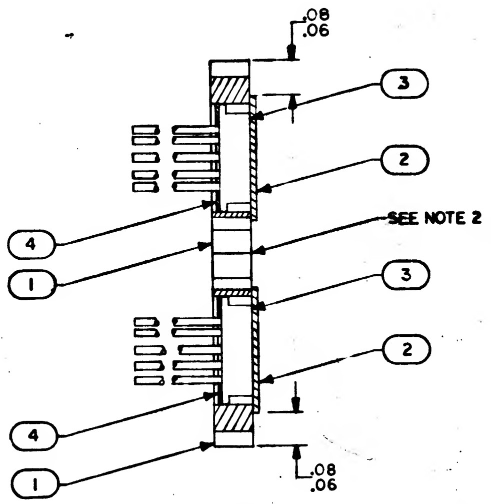
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE USE OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS TDRR 00514 "B"

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00903	16 APR 63	W.K.
B	REVISED PER TDRR 1631	6/19/63	RFR
C	REVISED PER TDRR 01851	7/1/63	RDF
D	REVISED PER TDRR 02296	7/29/63	WOT
E	REVISED PER TDRR 03048	8-12-63	WK
F	REVISED PER TDRR 03439	9-26-63	







SECTION A-A
SCALE 5:1

NOTES

1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. BOND HOUSINGS PER ND1002004 ORIENTING AS SHOWN
3. AR DENOTES AS REQUIRED QUANTITY
4. ☒ IN TABLE SIGNIFIES FIND NO. 3 TO BE OMITTED IN THIS POSITION

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1004098	WASHER, MYLAR	4
SEE TAB	1006771	MICRO, NOR GATE (TO 47)	3
2	1006826-3	INSULATION TAPE, ELECTRICAL	2
2	1004095	HOUSING, MICRO LOGIC (TO 47)	1

LIST OF MATERIALS

MASTER

1003082	
NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL
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MIT INSTRUMENTATION LAB
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DWG. NO. CONTRACT
DRAWN DATE 26 Feb 63
CHECKED 3/5/63
APPROVAL 3/5/63
APPROVAL 3/5/63
NASA APPROVAL Jack Barnard
MIT APPROVAL W. Kupfer 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(EVEN) (TABULATED)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003080
SCALE 2:1
WT
SHEET 1 OF 2

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

1003080

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REVISIONS TDRR 00514 "B"

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00903	16 APR 63	WBT WK
B	REVISED PER TDRR 1631	6/19/63	RAK
C	REVISED PER TDRR 01851	7/2/63	
D	REVISED PER TDRR 01872	7/26/63	WBT
E	REVISED PER TDRR 03048	9-12-63	WBT WK
F	REVISED PER TDRR 03439	9-26-63	

POSITION NO. (SEE NOTE 4)

MODULE NO.	A1-A16	A17	A18	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30-A31	A32	A33-A34	A35	A36	A37	A38	A26				
PART NO. 1003080	-1	-2	-3	-4	-5	-6	-7	-8	[illegible]	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20				
REVISION	—	—	—	—	—		—				—		—		—				—	F				
02											X						X							
04																								
06										X				X					X					
08																								
10	X				X	X	X												X					
12			X			X																		
14			X																X					
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48					X						X													
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66			X					X			X						X							
68															X									
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110				X	X		X																	
112																								
114				X									X											
116						X	X																	
118				X									X											
120																								
TOTAL TO 47 THIS ASSY	56	60	50	54	47	49	52	57	56	58	57	60	58	58	58	58	56	60	56	58				

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING

MATERIAL

HEAT TREATMENT

FINAL FINISH

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INSTRUMENTATION LAB
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DWG. NO.
CONTRACT

DRAWN Tom Gilligan DATE 26 FEB 63
CHECKED 3/5/63
APPROVAL W.B. Turner 3/5/63
APPROVAL 3/6/63
NASA APPROVAL
MIT APPROVAL 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING SUB-ASSEMBLY
(EVEN) (TABULATED)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003080
SCALE —
WT
SHEET 2 OF 2

MASTER

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

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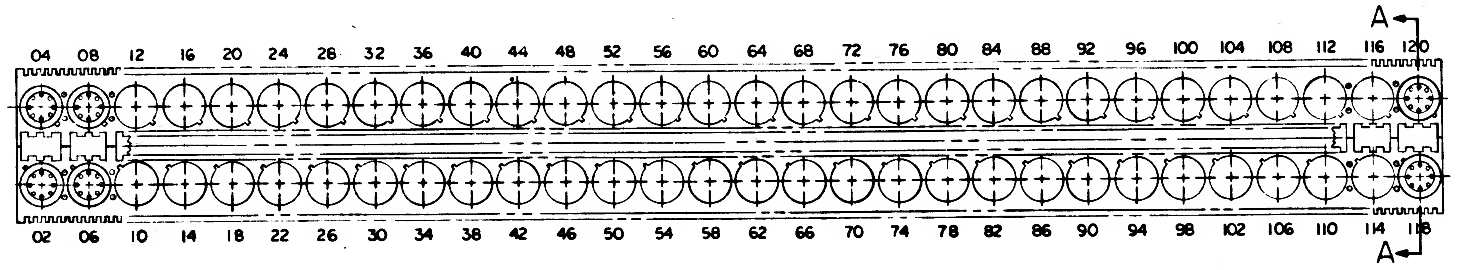
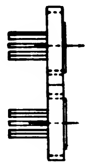
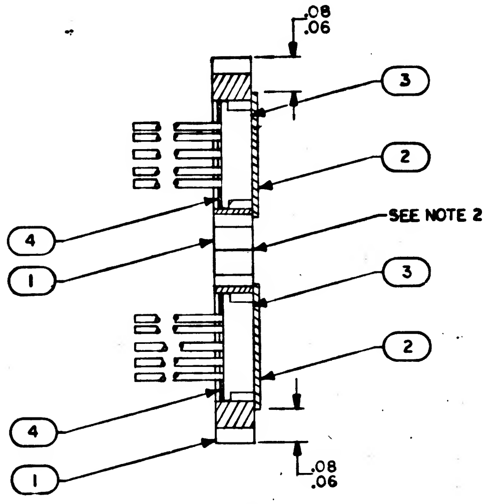
REVISIONS TDRR 00514 "B"

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00903	16 APR 63	WBT WK
B	REVISED PER TDRR 1631	4/19/63	RPK [illegible]
C	REVISED PER TDRR 01851	7/2/63	RDE [illegible]
D	REVISED PER TDRR 02296	7/28/63	WBT [illegible]
E	REVISED PER TDRR 03048	8-12-63	WBT WK
F	REVISED PER TDRR 03439	9-26-63	[illegible]
G	REVISED PER TDRR 03590	10-3-63	WK







SECTION A-A
SCALE 5:1

NOTES
1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. BOND HOUSINGS PER ND1002004 ORIENTING AS SHOWN
3. AR DENOTES AS REQUIRED QUANTITY
4. ☒ IN TABLE SIGNIFIES FIND NO. 3 TO BE OMITTED IN THIS POSITION

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1004098	WASHER, MYLAR	4
SEE TAB	1006771	MICRO, NOR GATE (TO 47)	3
2	1006826-3	INSULATION TAPE, ELECTRICAL	2
2	1004095	HOUSING, MICRO LOGIC (TO 47)	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082	

APPLICATION

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INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO.
CONTRACT

DRAWN Tony Hilliker DATE 26 Feb 63
CHECKED 3/1/63
APPROVAL WBT 3/5/63
APPROVAL 3/6/63
NASA APPROVAL Jack Barnes
MIT APPROVAL 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(EVEN) (TABULATED)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003080
SCALE 2:1
WT
SHEET 1 OF 2

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS TDRR 00514 "B"			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00803	16 APR 63	WBT WK
B	REVISED PER TDRR 1631	4/19/63	RAK
C	REVISED PER TDRR 01851	7/2/63	
D	REVISED PER TDRR 0186	7/24/63	WBT
E	REVISED PER TDRR 03048	8-12-63	WBT WK
F	REVISED PER TDRR 03439	9-26-63	
G	REVISED PER TDRR 03570	10-3-63	WK

POSITION NO. (SEE NOTE 4)

MODULE NO.	A1-A16	A17	A18	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30-A31	A32	A33-A34	A35	A36	A37	A38	A26	A36	A22	A38	A28
PART NO. 1003080	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24
REVISION	—	—	—	—	—		—				—		—		—				—	F	G			
02											X						X				X			
04																								
06										X				X					X				X	
08																								
10	X				X	X	X												X			X	X	
12			X			X																		
14			X																X					
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112																					X			
114				X									X											
116						X	X														X			
118				X									X											
120																								
TOTAL TO 47 THIS ASSY	56	60	50	54	47	49	52	57	56	58	57	60	58	58	58	58	56	60	56	58	53	45	57	60

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

1003082	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
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DO NOT SCALE THIS DRAWING
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HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN DATE 26 FEB 63
CHECKED 3/5/63
APPROVAL 3/5/63
APPROVAL 3/4/63
NASA APPROVAL
MIT APPROVAL 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

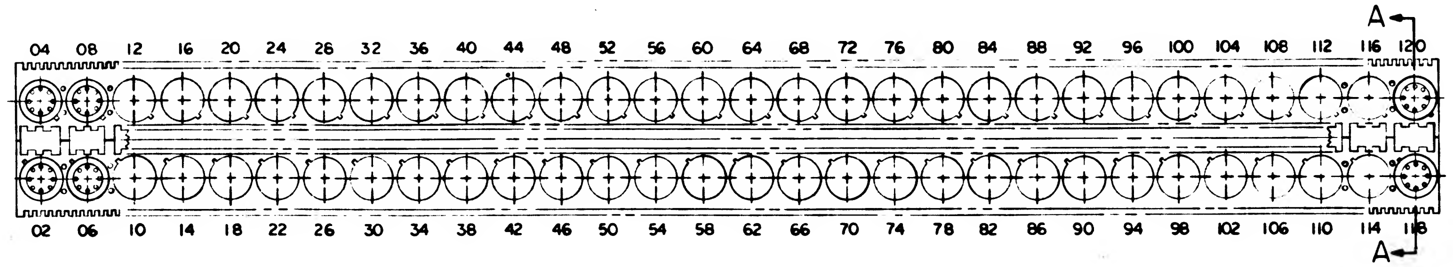
TO-47 HOUSING
SUB-ASSEMBLY
(EVEN) (TABULATED)

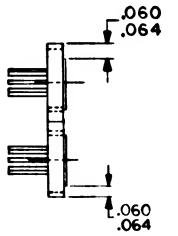
CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003080
SCALE —
WT
SHEET 2 OF 2

MASTER

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

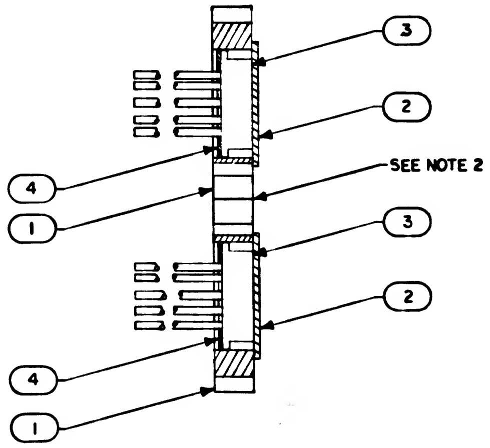
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL





FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00514 DATE 6 Mar 63



SECTION A-A
SCALE 5:1

NOTES

1. INTERPRET DWG IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. BOND HOUSINGS PER ND1002004 ORIENTING AS SHOWN
3. BOND FIND NO.2 TO FIND NO.1 PER ND1002004
4. BOND FIND NO.3 TO FIND NO.2 PER ND1002004
5. BOND FIND NO.4 TO FIND NO.3 PER ND1002004

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1004098	WASHER, MYLAR	4
	1006771	MICRO, NOR GATE (TO 47)	3
2	1004099	STRIP, BACKING	2
2	1004095	HOUSING, MICRO LOGIC (TO 47)	1

LIST OF MATERIALS

MASTER

1003082	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT

DRAWN Tom Hilligan DATE 26 Feb 63
CHECKED 3/5/63
APPROVAL WS Turner 3/5/63
APPROVAL S Draper 3/6/63
NASA APPROVAL Jack Barnard
MIT APPROVAL W Kupfer 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

TO-47 HOUSING
SUB-ASSEMBLY
(EVEN)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003080
SCALE 2:1
WT
SHEET 1 OF 2

1003080

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

PIN CO-ORD NO.	STICK NUMBER																							
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TOTAL TO 47 PER STICK																								

FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00514 DATE 6 Mar 63

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON
1003082	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO. CONTRACT
DRAWN DATE 26 FEB 63
CHECKED 3/5/63
APPROVAL W B Turner 3/5/63
APPROVAL 3/6/63
NASA APPROVAL
MIT APPROVAL 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

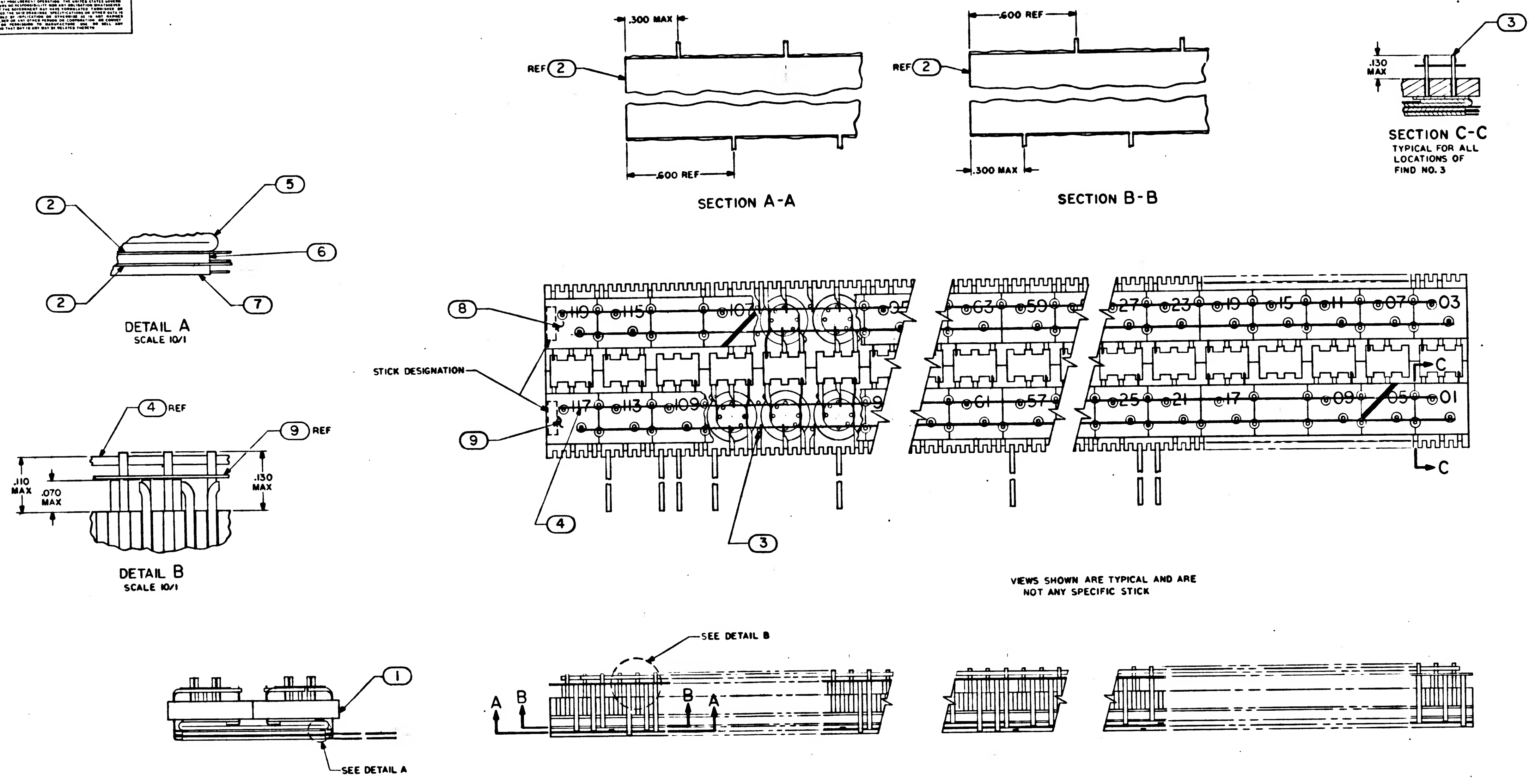
TO-47 HOUSING
SUB-ASSEMBLY
(EVEN)

CODE IDENT NO.
SIZE D
NASA DRAWING NO. 1003080
SCALE —
WT
SHEET 2 OF 2

1003080

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00F99	16 APR 63	



DESCRIPTION	STICK NO.	INSULATOR FIND NO. 8	INSULATOR FIND NO. 9	MATRIX 3 FIND NO. 5	MATRIX 5 FIND NO. 6	MATRIX 7 FIND NO. 7	TO-47 HOUSING FIND NO. 1	PART NO.
ARITHMETIC STICK	C1-16	1004015-3	1004015-1	1003063-1	1003064-3			1003081-1

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND1002005
3. A.R. DENOTES AS REQUIRED

1003081 A

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	SEE CHART	INSULATOR, STICK	9
1	SEE CHART	INSULATOR, STICK	8
1	SEE CHART	.800 MATRIX ASSEMBLY (7)	7
1	SEE CHART	.800 MATRIX ASSEMBLY (5)	6
1	SEE CHART	1.400 MATRIX ASSEMBLY (3)	5
A.R.	1006757-7	WIRE, ELEC NICKEL .005 X .020	4
A.R.	1015402	WIRE, ELEC KOVAR	3
2	1004100	GROUND PLANE	2
1	SEE CHART	TO-47 HOUSING SUB-ASSEMBLY (ODD)	1

LIST OF MATERIALS

1003074	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO CONTRACT
DRAWN DATE 4-4-63
CHECKED 3/5/63
APPROVAL 3/5/63
APPROVAL 3/4/63
NASA APPROVAL
MIT APPROVAL 6 Apr 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MICRO-LOGIC STICK SUB-ASSEMBLY (ODD)

CODE IDENT NO | SIZE E | NASA DRAWING NO. 1003081
SCALE 4/1 | WT | SHEET 1 OF 1

MASTER

INCHES
0 1 2
PHOTOGRAPHIC SCALE ONLY

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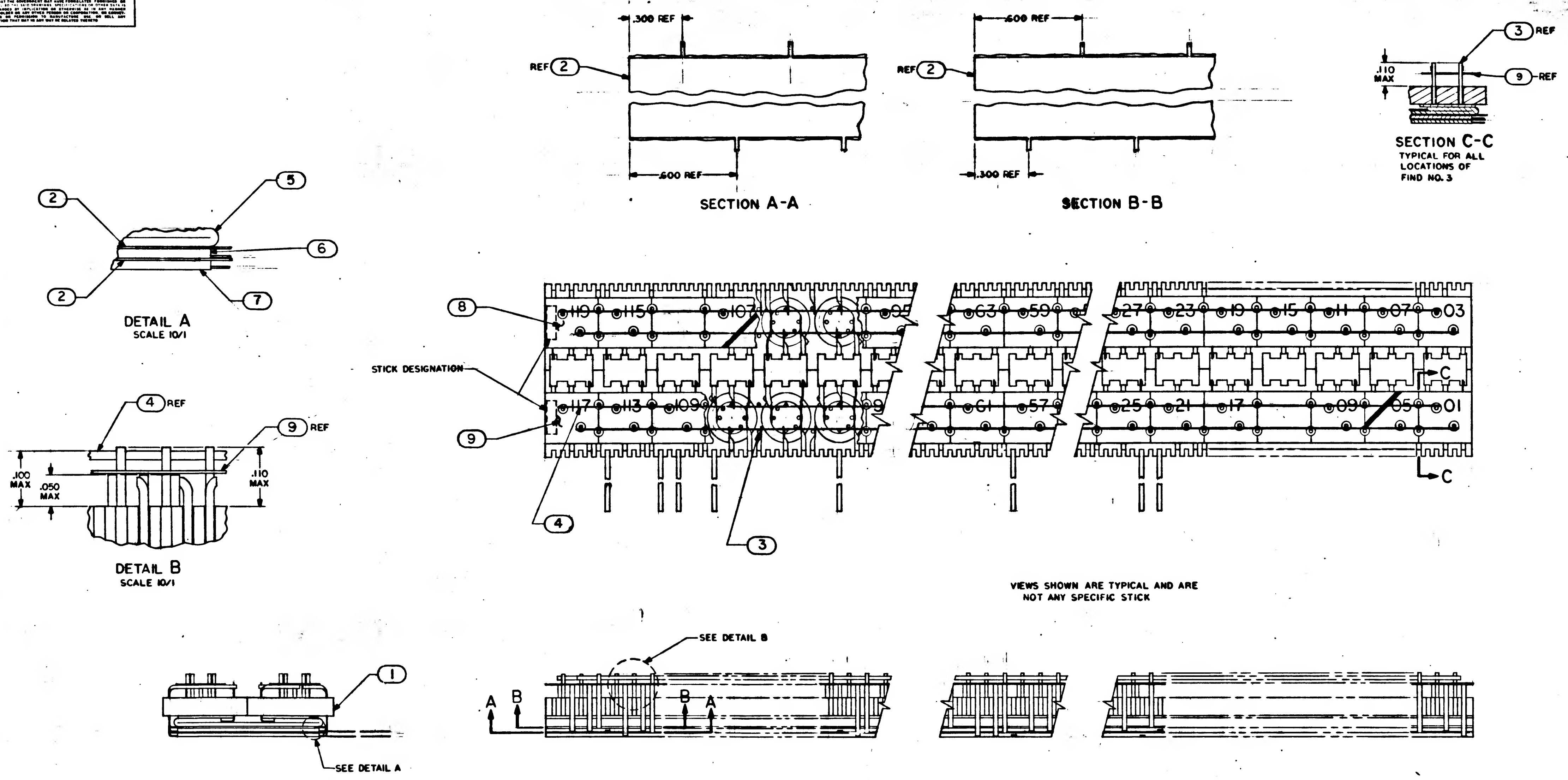
REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
A	PEVISED / UPGRADEC TO CLASS A PER TDRR 00F99	16	
B	REVISED PER TDRR 01742	6/6/63	



LOGIC MODULE NO.	INSULATOR FIND NO. 8	INSULATOR FIND NO. 9	MATRIX 3 FIND NO. 5	MATRIX 5 FIND NO. 6	MATRIX 7 FIND NO. 7	TO-47 HOUSING FIND NO. 1	PART NO.
A1-16	1004015-3	1004015-1	1003063-1	1003064-3			1003081-1
A17							
A18							
A21							
A22							
A23							
A24							
A25							
A26							
A27							
A28							
A29							
A30-31							
A32							
A33-34							
A35							
A36							
A37							
A38							

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND1002005
3. A.R. DENOTES AS REQUIRED

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
1	SEE CHART	INSULATOR, STICK	9
1	SEE CHART	INSULATOR, STICK	8
1	SEE CHART	.800 MATRIX ASSEMBLY (7)	7
1	SEE CHART	.800 MATRIX ASSEMBLY (5)	6
1	SEE CHART	1.400 MATRIX ASSEMBLY (3)	5
A.R.	1006757-7	WIRE, ELEC NICKEL .005 X .020	4
A.R.	1015402	WIRE, ELEC KOVAR	3
2	1004100	GROUND PLANE	2
1	SEE CHART	TO-47 HOUSING SUB-ASSEMBLY (ODD)	1

LIST OF MATERIALS

MASTER

1003074	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
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INSTRUMENTATION LAB
CAMBRIDGE, MASS.
DWG. NO. CONTRACT
DRAWN DATE 4-44-63
CHECKED 7/5/63
APPROVAL 7/5/63
APPROVAL SD
NASA APPROVAL
MIT APPROVAL 6 Jul 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MICRO-LOGIC MODULE SUB-ASSEMBLY (ODD)

CODE IDENT NO. SIZE E NASA DRAWING NO. 1003081
SCALE 4/1 WT SHEET 1 OF 1

1003081 B

INCHES
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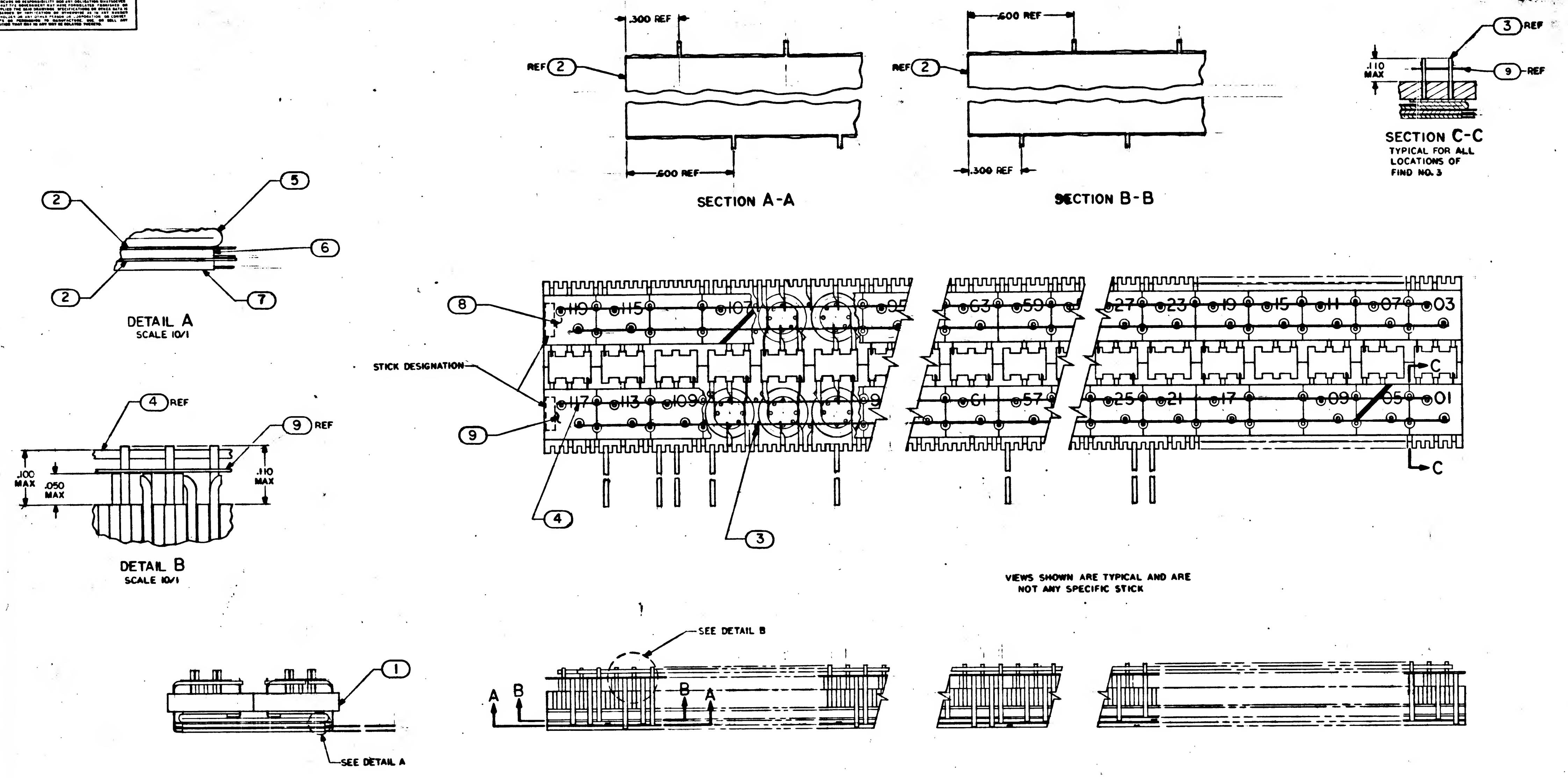
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00699	16 APR 63	[illegible]
B	REVISED PER TDRR 01742	[illegible]	WR
C	REVISED PER TDRR D3044	7/24/63	[illegible]



NEXT ASSY	INSULATOR FIND NO. 8	INSULATOR FIND NO. 9	MATRIX 3 FIND NO. 5	MATRIX 5 FIND NO. 6	MATRIX 7 FIND NO. 7	TO-47 HOUSING FIND NO. 1	PART NO.	REV
1003074	1004170 -3	1004170 -1	1003063-2	1003064-3		1003079-1	1003081-1	
1003174-1	1004173 -3	1004173 -1	1003063-8	1003064-15		1003079-2	1003081 -2	
1003174-2	1004172 -3	1004172 -1	1003063-6	1003064-11		1003079-3	1003081 -3	
1003174-3	1004186 -3	1004186 -1	1003063-34	1003064-67	1003064 -68	1003079-4	1003081 -4	
1003174-4	1004183 -3	1004183 -1	1003063-28	1003064-55	1003064 -56	1003079-5	1003081 -5	
1003174-5	1004175 -3	1004175 -1	1003063-12	1003064 -59		1003079-6	1003081 -6	
1003174-6	1004185 -3	1004185 -1	1003063-32	1003064-63	1003064 - 64	1003079-7	1003081 - 7	
1003174-7	1004184 -3	1004184 -1	1003063 -30	1003064 -23		1003079-8	1003081 - 8	
1003174-8	1004179 -3	1004179 -1	1003063 -20	1003064 -39		1003079-9	1003081 - 9	
1003174-9	1004174 -3	1004174 -1	1003063 -10	1003064 -19		1003079-10	1003081 -10	
1003174-10	1004182 -3	1004182 -1	1003063 -26	1003064 -51		1003079-11	1003081 - 11	
1003174-11	1004189 -3	1004189 -1	1003063 -38	1003064 -75		1003079-12	1003081 - 12	
1003174-12	1004178 -3	1004178 -1	1003063-18	1003064-35		1003079-13	1003081 -13	
1003174-13	1004176 -3	1004176 -1	1003063-14	1003064 -27		1003079-14	1003081 - 14	
1003174-14	1004177 -3	1004177 -1	1003063-16	1003064 -31		1003079-15	1003081 -15	
1003174-15	1004171 -1	1004171 -1	1003063 -4	1003064 - 7		1003079-16	1003081 - 16	
1003174-16	1004187 -3	1004187 -1	1003063 -36	1003064 -71		1003079-17	1003081 - 17	
1003174-17	1004180 -3	1004180 -1	1003063 - 22	1003064 - 43		1003079-18	1003081 - 18	
1003174-18	1004181 -3	1004181 -1	1003063-24	1003064-47		1003079-19	1003081-19	

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND1002005
3. A.R. DENOTES AS REQUIRED

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
1	SEE CHART	INSULATOR, STICK	9
1	SEE CHART	INSULATOR, STICK	8
1	SEE CHART	.800 MATRIX ASSEMBLY (7)	7
1	SEE CHART	.800 MATRIX ASSEMBLY (5)	6
1	SEE CHART	1.400 MATRIX ASSEMBLY (3)	5
A.R.	1006757-7	WIRE, ELEC NICKEL .005 X .020	4
A.R.	1015402	WIRE, ELEC KOVAR	3
2	1004100	GROUND PLANE	2
1	SEE CHART	TO-47 HOUSING SUB-ASSEMBLY (ODD)	1

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

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INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT
DRAWN [illegible] DATE [illegible]
CHECKED [illegible] 7/5/63
APPROVAL W. S. [illegible] 7/5/63
APPROVAL [illegible] 7/6/63
NASA APPROVAL [illegible]
MIT APPROVAL [illegible] 6 Aug 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MICRO-LOGIC MODULE SUB-ASSEMBLY (ODD)
(TABULATED)

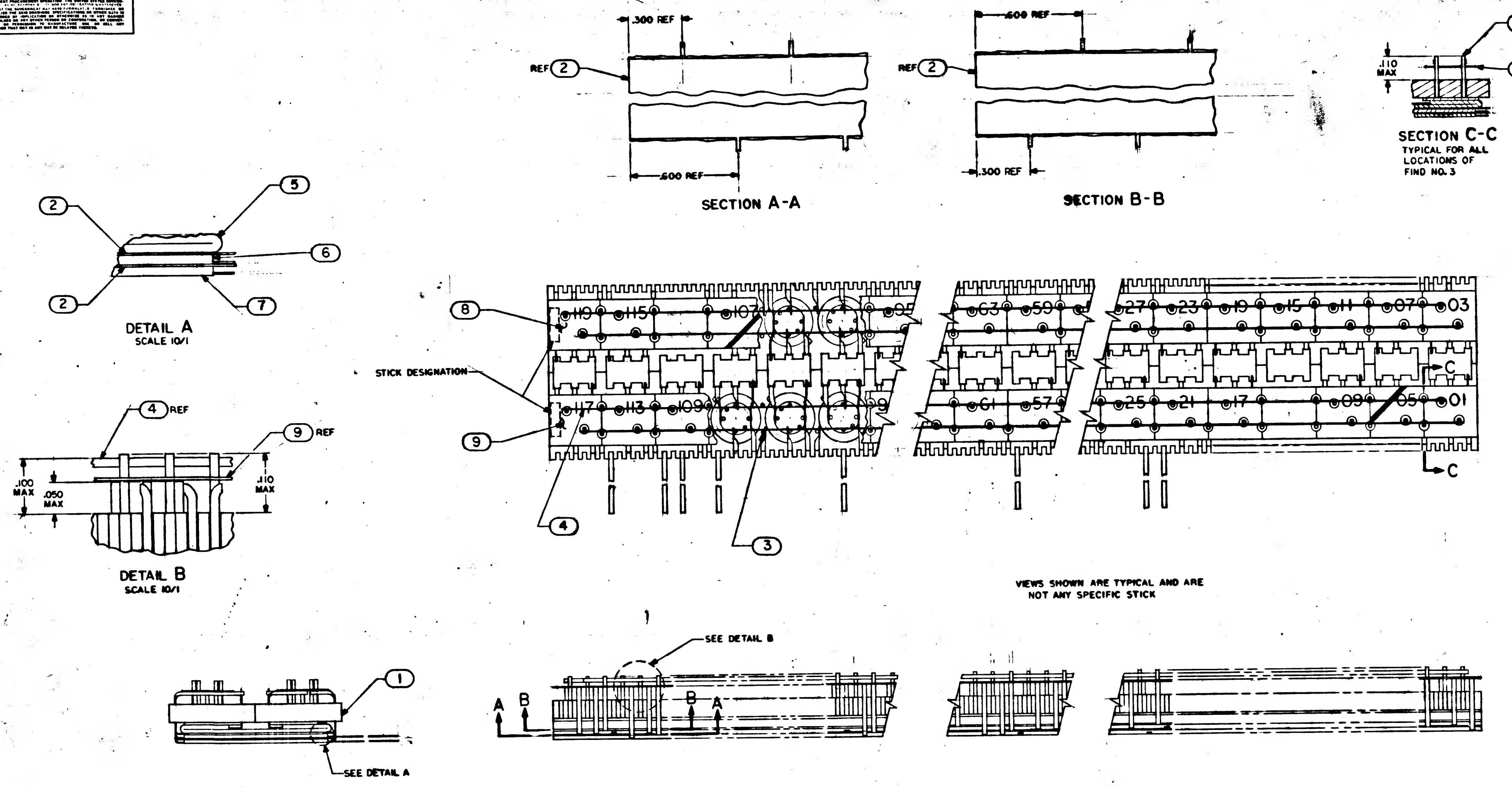
CODE IDENT NO. SIZE E NASA DRAWING NO. 1003081
SCALE 4/1 WT SHEET 1 OF 1

1003081 C

MASTER

INCHES
PHOTOGRAPHIC SCALE ONLY

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER [illegible]	[illegible]-63	[illegible]
B	REVISED PER TDRR 01742	[illegible]/63	WR
C	REVISED PER TDRR 03044	7/26/63	[illegible]
D	REVISED PER TDRR 03435	9-26-63	[illegible]



MODULE NO.	INSULATOR FIND NO. 8	REV	INSULATOR FIND NO. 9	REV	MATRIX 3 FIND NO. 5	MATRIX 5 FIND NO. 6	MATRIX 7 FIND NO. 7	TO-47 HOUSING FIND NO. 1	PART NO.	REV
A1—A16	1004170-3		1004170-1		1003063-2	1003064-3		1003079-1	1003081-1	
A17	1004173-3		1004173-1		1003063-8	1003064-15		1003079-2	1003081-2	
A18	1004172-3		1004172-1		1003063-6	1003064-11		1003079-3	1003081-3	
A21	1004186-3		1004186-1		1003063-34	1003064-67	1003064-68	1003079-4	1003081-4	
A22	1004183-3		1004183-1		1003063-28	1003064-55	1003064-56	1003079-5	1003081-5	
A23	1004175-3		1004175-1		1003063-12	1003064-59		1003079-6	1003081-6	
A24	1004185-3		1004185-1		1003063-32	1003064-63	1003064-64	1003079-7	1003081-7	
A25	1004184-3		1004184-1		1003063-30	1003064-23		1003079-8	1003081-8	
A26	1004179-3		1004179-1		1003063-20	1003064-39		1003079-9	1003081-9	
A27	1004174-3		1004174-1		1003063-10	1003064-19		1003079-10	1003081-10	
A28	1004182-3		1004182-1		1003063-26	1003064-51		1003079-11	1003081-11	
A29	1004189-3		1004189-1		1003063-38	1003064-75		1003079-12	1003081-12	
A30—A31	1004178-3		1004178-1		1003063-18	1003064-35		1003079-13	1003081-13	
A32	1004176-3		1004176-1		1003063-14	1003064-27		1003079-14	1003081-14	
A33—A34	1004177-3		1004177-1		1003063-16	1003064-31		1003079-15	1003081-15	
A35	1004171-1		1004171-1		1003063-4	1003064-7		1003079-16	1003081-16	
A36	1004187-3		1004187-1		1003063-36	1003064-71		1003079-17	1003081-17	
~~A37~~	~~1004180-3~~		~~1004180-1~~		~~1003063-22~~	~~1003064-45~~		~~1003079-18~~	~~1003081-18~~	
A38	1004181-3		1004181-1		1003063-24	1003064-47		1003079-19	1003081-19	
A37	1004180-3	A	1004180-1	A	1003063-22	1003064-76		1003079-18	1003081-20	D

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND1002005
3. A.R. DENOTES AS REQUIRED

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
1	SEE CHART	INSULATOR, STICK	9
1	SEE CHART	INSULATOR, STICK	8
1	SEE CHART	.800 MATRIX ASSEMBLY (7)	7
1	SEE CHART	.800 MATRIX ASSEMBLY (5)	6
1	SEE CHART	1.400 MATRIX ASSEMBLY (3)	5
A.R.	1006757-7	WIRE, ELEC NICKEL .005 X .020	4
A.R.	1015402	WIRE, ELEC KOVAR	3
2	1004100	GROUND PLANE	2
1	SEE CHART	TO-47 HOUSING SUB-ASSEMBLY (ODD)	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003074-	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
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DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS

DRAWN [illegible] DATE [illegible]
CHECKED [illegible] 7/5/63
APPROVAL [illegible] 7/5/63
APPROVAL [illegible]
NASA APPROVAL
MIT APPROVAL [illegible]

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MICRO-LOGIC MODULE SUB-ASSEMBLY (ODD)
(TABULATED)

CODE IDENT NO. SIZE E NASA DRAWING NO. 1003081
SCALE 4/1 WT SHEET 1 OF 1

MASTER

INCHES
PHOTOGRAPHIC SCALE ONLY

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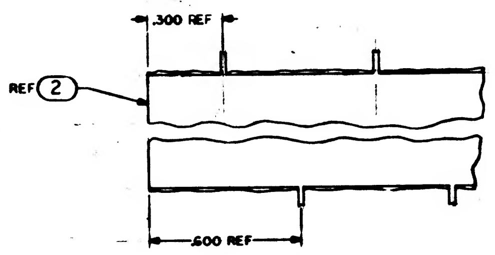
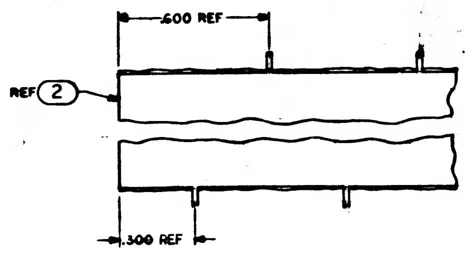
REVISIONS

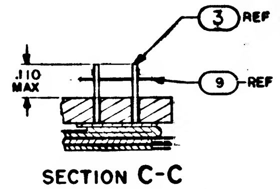
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00699	16 APR 63	WR
B	REVISED PER TDRR 01742	6/6/63	WR
C	REVISED PER TDRR 03044	7/24/63	
D	REVISED PER TDRR 03435	9-26-63	
E	REVISED PER TDRR 03588	10-8-63	



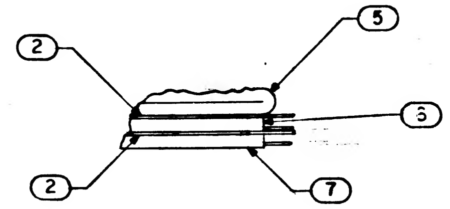
SECTION A-A



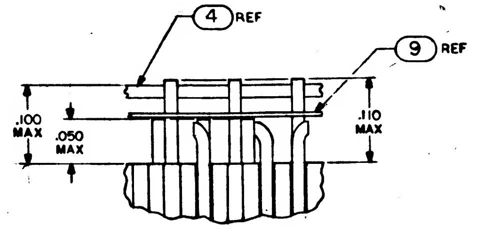
SECTION B-B



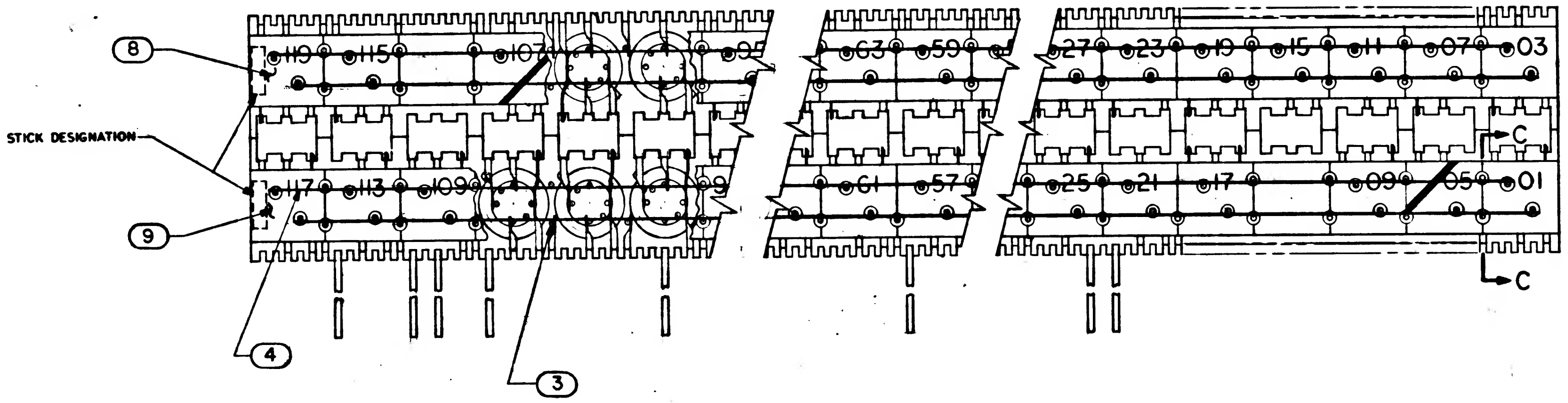
SECTION C-C
TYPICAL FOR ALL LOCATIONS OF FIND NO. 3



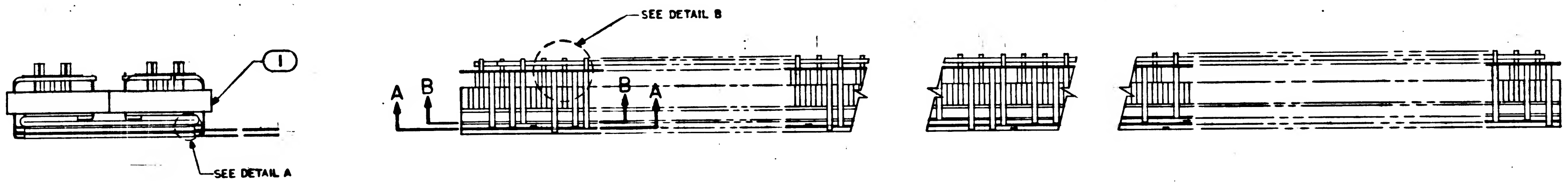
DETAIL A
SCALE 10/1



DETAIL B
SCALE 10/1



VIEWS SHOWN ARE TYPICAL AND ARE NOT ANY SPECIFIC STICK



NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND1002005
3. A.R. DENOTES AS REQUIRED

MODULE NO.	INSULATOR FIND NO. 8	REV	INSULATOR FIND NO. 9	REV	MATRIX 3 FIND NO. 5	MATRIX 5 FIND NO. 6	MATRIX 7 FIND NO. 7	TO-47 HOUSING FIND NO. 1	PART NO.	REV
A1—A16	1004170-3		1004170-1		1003063-2	1003064-3		1003079-1	1003081-1	
~~A17~~	~~1004173-3~~		~~1004173-1~~		~~1003063-8~~	~~1003064-15~~		~~1003079-2~~	~~1003081-2~~	
~~A18~~	~~1004172-3~~		~~1004172-1~~		~~1003063-6~~	~~1003064-11~~		~~1003079-3~~	~~1003081-3~~	
A21	1004186-3		1004186-1		1003063-34	1003064-67	1003064-68	1003079-4	1003081-4	
A22	1004183-3		1004183-1		1003063-28	1003064-55	1003064-56	1003079-5	1003081-5	
A23	1004175-3		1004175-1		1003063-12	1003064-59		1003079-6	1003081-6	
A24	1004185-3		1004185-1		1003063-32	1003064-63	1003064-64	1003079-7	1003081-7	
A25	1004184-3		1004184-1		1003063-30	1003064-23		1003079-8	1003081-8	
A26	1004179-3		1004179-1		1003063-20	1003064-39		1003079-9	1003081-9	
~~A27~~	~~1004174-3~~		~~1004174-1~~		~~1003063-10~~	~~1003064-19~~		~~1003079-10~~	~~1003081-10~~	
~~A28~~	~~1004182-3~~		~~1004182-1~~		~~1003063-26~~	~~1003064-51~~		~~1003079-11~~	~~1003081-11~~	
A29	1004189-3		1004189-1		1003063-38	1003064-75		1003079-12	1003081-12	
A30—A31	1004178-3		1004178-1		1003063-18	1003064-35		1003079-13	1003081-13	
A32	1004176-3		1004176-1		1003063-14	1003064-27		1003079-14	1003081-14	
A33—A34	1004177-3		1004177-1		1003063-16	1003064-31		1003079-15	1003081-15	
A35	1004171-1		1004171-1		1003063-4	1003064-7		1003079-16	1003081-16	
~~A36~~	~~1004187-3~~		~~1004187-1~~		~~1003063-36~~	~~1003064-71~~		~~1003079-17~~	~~1003081-17~~	
~~A37~~	~~1004180-3~~		~~1004180-1~~		~~1003063-22~~	~~1003064-43~~		~~1003079-18~~	~~1003081-18~~	
A38	1004181-3		1004181-1		1003063-24	1003064-47		1003079-19	1003081-19	
A37	1004180-3	A	1004180-1	A	1003063-22	1003064-76		1003079-18	1003081-20	D
A36	1004187-3		1004187-1	B	1003063-40	1003064-78		1003079-20	1003081-21	E
A18	1004172-3	B	1004172-1	B	1003063-42	1003064-89		1003079-3	1003081-22	E
A27	1004174-3	A	1004174-1		1003063-46	1003064-19		1003079-10	1003081-23	E
A17	1004173-3		1004173-1		1003063-8	1003064-92		1003079-2	1003081-24	E
A28	1004182-3	B	1004182-1	B	1003063-48	1003064-94		1003079-21	1003081-25	E

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
1	SEE CHART	INSULATOR, STICK	9
1	SEE CHART	INSULATOR, STICK	8
1	SEE CHART	.800 MATRIX ASSEMBLY (7)	7
1	SEE CHART	.800 MATRIX ASSEMBLY (5)	6
1	SEE CHART	1.400 MATRIX ASSEMBLY (3)	5
A.R.	1006757-7	WIRE, ELEC NICKEL .005 X .020	4
A.R.	1015402	WIRE, ELEC KOVAR	3
2	1004100	GROUND PLANE	2
1	SEE CHART	TO-47 HOUSING SUB-ASSEMBLY (ODD)	1

LIST OF MATERIALS

NEXT ASSY	USED ON
1003074-	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING

MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS

DRAWN DATE 4-4-63
CHECKED 3/5/63
APPROVAL 3/5/63
APPROVAL 3/5/63
NASA APPROVAL
MIT APPROVAL 6 Mar 63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MICRO-LOGIC MODULE SUB-ASSEMBLY (ODD)
(TABULATED)

CODE IDENT NO. — SIZE E — NASA DRAWING NO. 1003081
SCALE 4/1 — WT — SHEET 1 OF 1

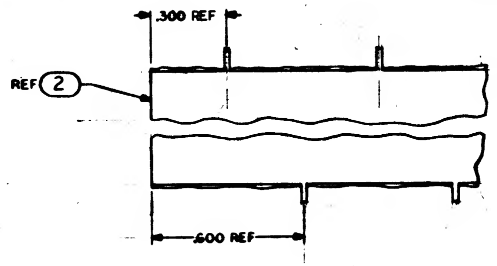
1003081 E

MASTER

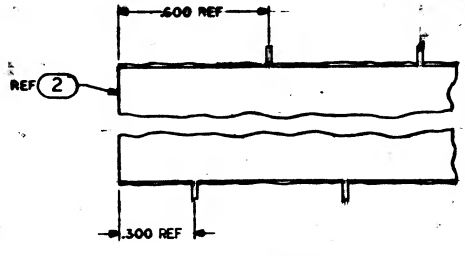
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS

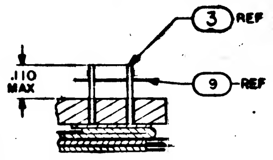
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00F97	10 APR 63	WR
B	REVISED PER TDRR 01742	6/26/63	WR
C	REVISED PER TDRR 03044	7/24/63	WR
D	REVISED PER TDRR 03435	9-26-63	WR
E	REVISED PER TDRR 03588	10-3-63	WR
F	REVISED PER TDRR 04032	10-17-63	WR



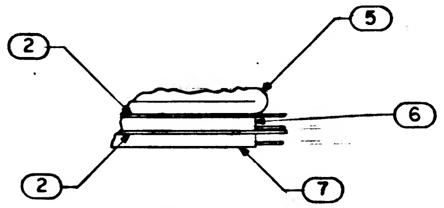
SECTION A-A



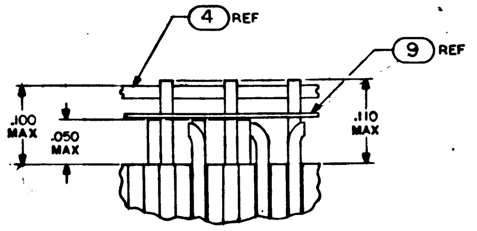
SECTION B-B



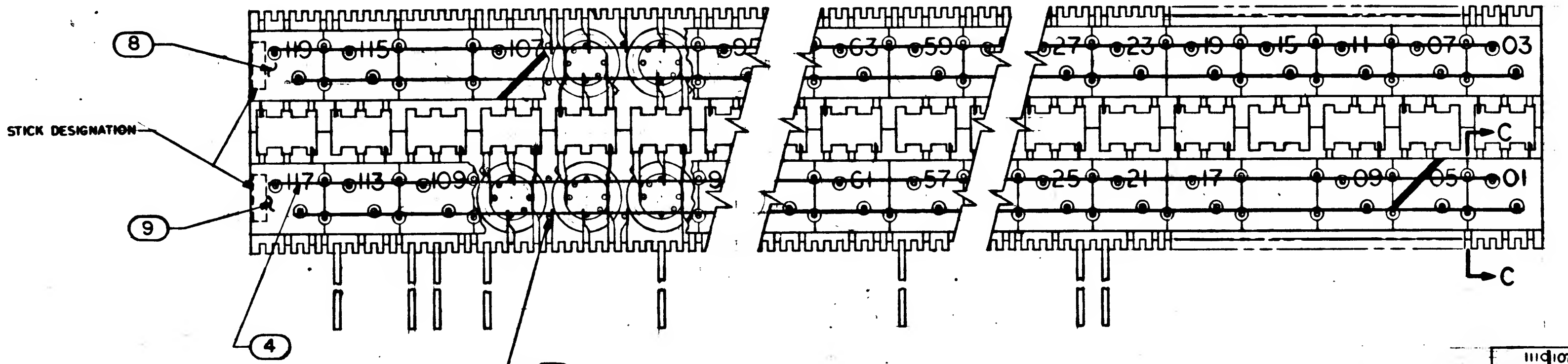
SECTION C-C
TYPICAL FOR ALL LOCATIONS OF FIND NO. 3

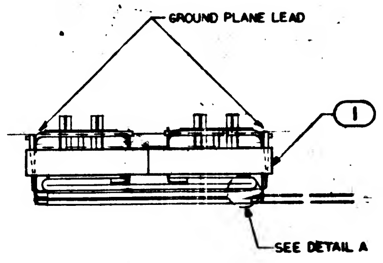


DETAIL A
SCALE 10/1

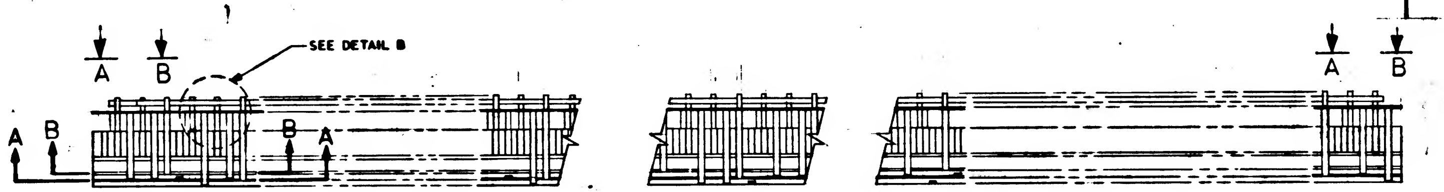


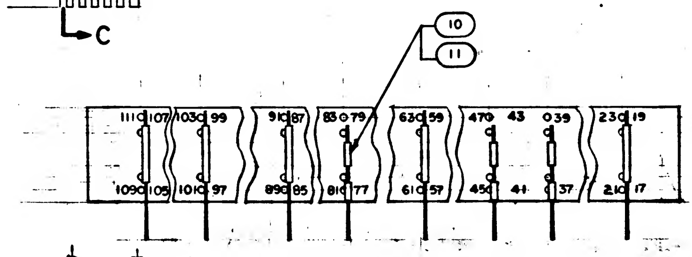
DETAIL B
SCALE 10/1





VIEWS SHOWN ARE TYPICAL AND ARE NOT ANY SPECIFIC STICK

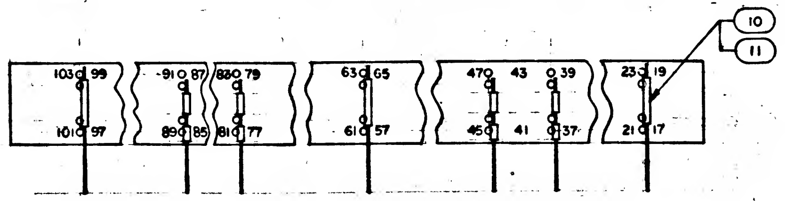




VIEW A-A
SCALE: NONE
TYP FOR MODULES A1 THRU A16
SHOWING LOCATION OF JUMPER WIRES ONLY
SEE NOTE 4

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND1002005
3. A.R. DENOTES AS REQUIRED
4. CUT 3V BUSS BETWEEN GATES 87 & 83

MODULE NO.	INSULATOR FIND NO. 8	REV	INSULATOR FIND NO. 9	REV	MATRIX 3 FIND NO. 5	MATRIX 5 FIND NO. 6	MATRIX 7 FIND NO. 7	TO-47 HOUSING FIND NO. 1	PART NO.	REV	QUANTITY OF FIND NO. 2
A1—A16	1004170-3		1004170-1		1003063-2	1003064-3		1003079-1	1003081-1	F	1
~~A17~~	~~1004173-3~~		~~1004173-1~~		~~1003063-8~~	~~1003064-10~~		~~1003079-2~~	~~1003081-2~~		
~~A18~~	~~1004172-3~~		~~1004172-1~~		~~1003063-6~~	~~1003064-11~~		~~1003079-3~~	~~1003081-3~~		
A21	1004186-3		1004186-1		1003063-34	1003064-67	1003064-68	1003079-4	1003081-4	F	2
A22	1004183-3		1004183-1		1003063-28	1003064-55	1003064-56	1003079-5	1003081-5	F	2
A23	1004175-3		1004175-1		1003063-12	1003064-59		1003079-6	1003081-6	F	1
A24	1004185-3		1004185-1		1003063-32	1003064-63	1003064-64	1003079-7	1003081-7	F	2
A25	1004184-3		1004184-1		1003063-30	1003064-23		1003079-8	1003081-8	F	1
A26	1004179-3		1004179-1		1003063-20	1003064-39		1003079-9	1003081-9	F	1
~~A27~~	~~1004174-3~~		~~1004174-1~~		~~1003063-10~~	~~1003064-19~~		~~1003079-10~~	~~1003081-10~~		
~~A28~~	~~1004182-3~~		~~1004182-1~~		~~1003063-28~~	~~1003064-81~~		~~1003079-11~~	~~1003081-11~~		
A29	1004189-3		1004189-1		1003063-38	1003064-75		1003079-12	1003081-12	F	1
A30—A31	1004178-3		1004178-1		1003063-18	1003064-35		1003079-13	1003081-13	F	1
A32	1004176-3		1004176-1		1003063-14	1003064-27		1003079-14	1003081-14	F	1
A33—A34	1004177-3		1004177-1		1003063-16	1003064-31		1003079-15	1003081-15	F	1
A35	1004171-3		1004171-1		1003063-4	1003064-7		1003079-16	1003081-16	F	1
~~A36~~	~~1004187-3~~		~~1004187-1~~		~~1003063-36~~	~~1003064-71~~		~~1003079-17~~	~~1003081-17~~		
~~A37~~	~~1004180-3~~		~~1004180-1~~		~~1003063-22~~	~~1003064-43~~		~~1003079-18~~	~~1003081-18~~	F	1
A38	1004181-3		1004181-1		1003063-24	1003064-47		1003079-19	1003081-19	F	1
A37	1004180-3	A	1004180-1	A	1003063-22	1003064-76		1003079-18	1003081-20	F	1
A36	1004187-3		1004187-1	B	1003063-40	1003064-78		1003079-20	1003081-21	F	1
A18	1004172-5	B	1004172-1	B	1003063-42	1003064-89		1003079-3	1003081-22	F	1
A27	1004174-3	A	1004174-1		1003063-46	1003064-19		1003079-10	1003081-23	F	1
A17	1004173-3		1004173-1		1003063-8	1003064-92		1003079-2	1003081-24	F	1
A28	1004182-3	B	1004182-1	B	1003063-48	1003064-94		1003079-21	1003081-25	F	1



VIEW B-B
SCALE: NONE
TYP FOR MODULES A17, A18, A21 THRU A38
SHOWING LOCATION OF JUMPER WIRES
ONLY

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1006787-2	WIRE ELECTRICAL .020 DIA	11
AR	1006776-21	INSULATION, SLEEVING	10
1	SEE CHART	INSULATOR, STICK	9
1	SEE CHART	INSULATOR, STICK	8
1	SEE CHART	.800 MATRIX ASSEMBLY (7)	7
1	SEE CHART	.800 MATRIX ASSEMBLY (5)	6
1	SEE CHART	1.400 MATRIX ASSEMBLY (3)	5
A.R.	1006757-7	WIRE, ELEC NICKEL .005 X .020	4
A.R.	1015402	WIRE, ELEC KOVAR	3
—	SEE CHART	GROUND PLANE	2
1	SEE CHART	TO-47 HOUSING SUB-ASSEMBLY (ODD)	1

LIST OF MATERIALS

1003074-	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO.
CONTRACT

DRAWN J. Tsilsoon DATE 4/4/63
CHECKED 3/5/63
APPROVAL 3/5/63
APPROVAL
NASA APPROVAL
MIT APPROVAL 4/4/63

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MICRO-LOGIC MODULE SUB-ASSEMBLY (ODD)
(TABULATED)

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003081
SCALE 4/1
WT
SHEET 1 OF 1

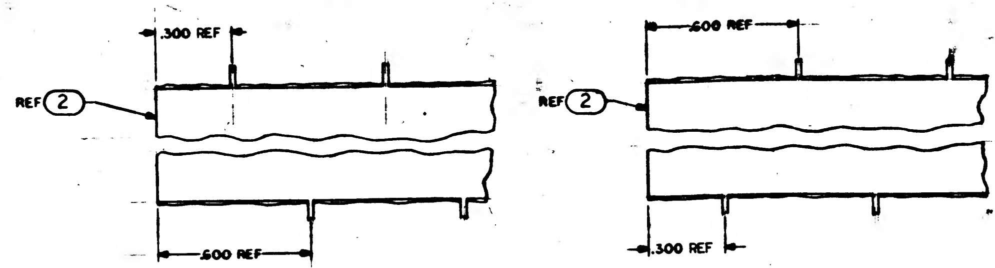
1003081 E

INCHES
PHOTOGRAPHIC SCALE ONLY

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

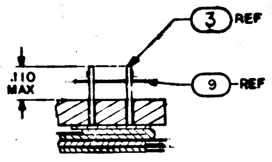
REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00699	16 63	
B	REVISED PER TDRR 01742	/63	WR
C	REVISED PER TDRR 03044	7-24-63	
D	REVISED PER TDRR 03435	9-26-63	
E	REVISED PER TDRR 03588	10-3-63	
F	REVISED PER TDRR 04032	10-17-63	
G	REVISED PER TDRR 04315		

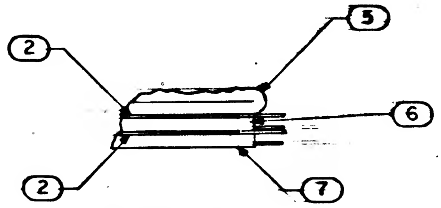


SECTION A-A

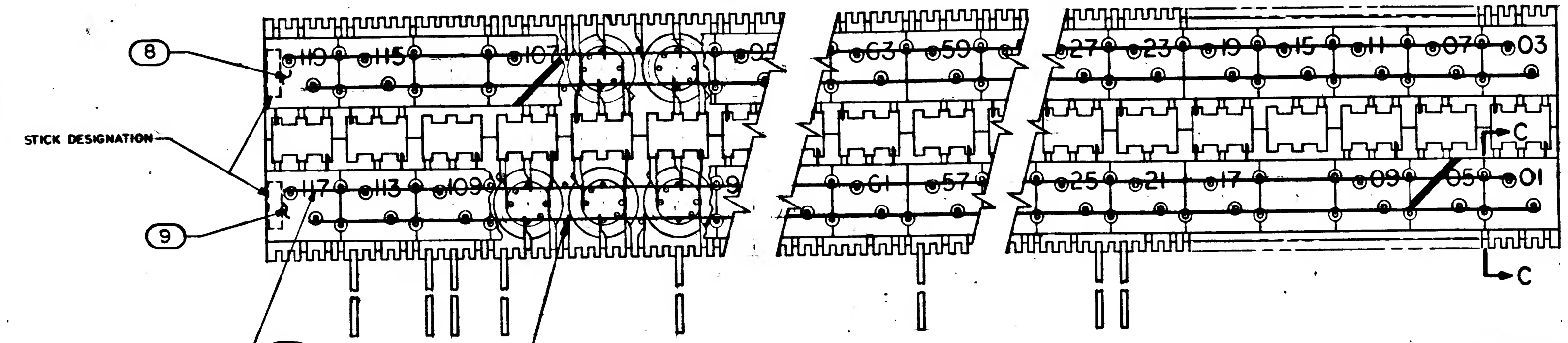
SECTION B-B

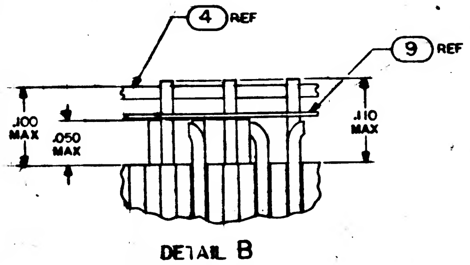


SECTION C-C
TYPICAL FOR ALL LOCATIONS OF FIND NO. 3

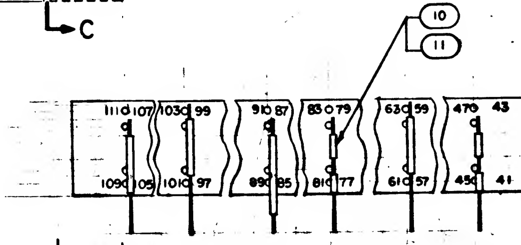


DETAIL A
SCALE 10/1

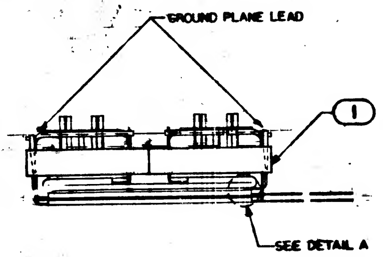


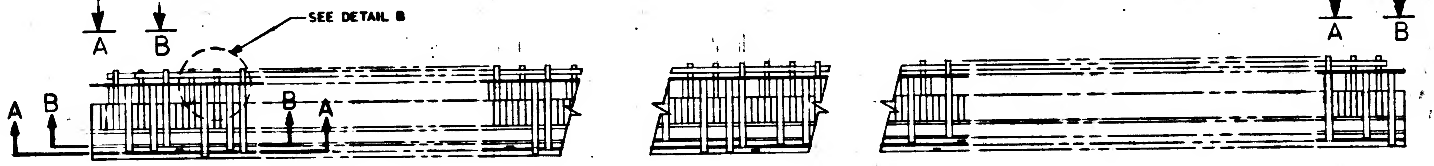


DETAIL B
SCALE 10/1



VIEWS SHOWN ARE TYPICAL AND ARE NOT ANY SPECIFIC STICK

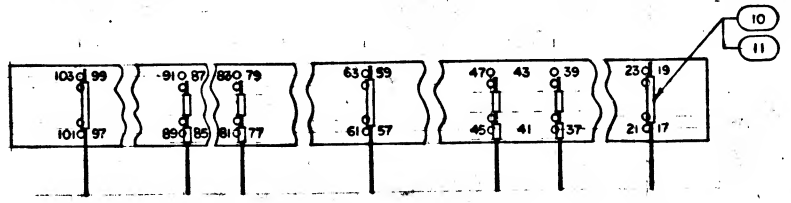




VIEW A-A
SCALE: NONE
TYP FOR MODULES A1 THRU A16
SHOWING LOCATION OF JUMPER WIRES ONLY
SEE NOTE 4

MODULE NO.	INSULATOR FIND NO. 8	REV	INSULATOR FIND NO. 9	REV	MATRIX 3 FIND NO. 5	MATRIX 5 FIND NO. 6	MATRIX 7 FIND NO. 7	TO-47 HOUSING FIND NO. 1	PART NO.	REV	QUANTITY OF FIND NO. 2
A1—A16	1004170-3		1004170-1		1003063-2	1003064-3		1003079-1	1003081-1	F	1
~~A17~~	~~1004173-3~~		~~1004173-1~~		~~1003063-8~~	~~1003064-18~~		~~1003079-2~~	~~1003081-2~~		
~~A18~~	~~1004172-3~~		~~1004172-1~~		~~1003063-6~~	~~1003064-1~~		~~1003079-3~~	~~1003081-3~~		
A21	1004186-3		1004186-1		1003063-34	1003064-67	1003064-68	1003079-4	1003081-4	F	2
A22	1004183-3		1004183-1		1003063-28	1003064-55	1003064-56	1003079-5	1003081-5	F	2
A23	1004175-3		1004175-1		1003063-12	1003064-59		1003079-6	1003081-6	F	1
A24	1004185-3		1004185-1		1003063-32	1003064-63	1003064-64	1003079-7	1003081-7	F	2
A25	1004184-3		1004184-1		1003063-30	1003064-23		1003079-8	1003081-8	F	1
A26	1004179-3		1004179-1		1003063-20	1003064-39		1003079-9	1003081-9	F	1
~~A27~~	~~1004174-3~~		~~1004174-1~~		~~1003063-10~~	~~1003064-19~~		~~1003079-10~~	~~1003081-10~~		
~~A28~~	~~1004182-3~~		~~1004182-1~~		~~1003063-26~~	~~1003064-51~~		~~1003079-11~~	~~1003081-11~~		
A29	1004189-3		1004189-1		1003063-38	1003064-75		1003079-12	1003081-12	F	1
A30—A31	1004178-3		1004178-1		1003063-18	1003064-35		1003079-13	1003081-13	F	1
A32	1004176-3		1004176-1		1003063-14	1003064-27		1003079-14	1003081-14	F	1
A33—A34	1004177-3		1004177-1		1003063-16	1003064-31		1003079-15	1003081-15	F	1
A35	1004171-3		1004171-1		1003063-4	1003064-7		1003079-16	1003081-16	F	1
~~A36~~	~~1004187-3~~		~~1004187-1~~		~~1003063-36~~	~~1003064-71~~		~~1003079-17~~	~~1003081-17~~		
~~A37~~	~~1004180-3~~		~~1004180-1~~		~~1003063-22~~	~~1003064-43~~		~~1003079-18~~	~~1003081-18~~	F	1
A38	1004181-3		1004181-1		1003063-24	1003064-47		1003079-19	1003081-19	F	1
A37	1004180-3	A	1004180-1	A	1003063-22	1003064-76		1003079-18	1003081-20	F	1
A36	1004187-3		1004187-1	B	1003063-40	1003064-78		1003079-20	1003081-21	F	1
A18	1004172-3	B	1004172-1	B	1003063-42	1003064-89		1003079-3	1003081-22	F	1
A27	1004174-3	A	1004174-1		1003063-46	1003064-19		1003079-10	1003081-23	F	1
A17	1004173-3		1004173-1		1003063-8	1003064-92		1003079-2	1003081-24	F	1
A28	1004182-3	B	1004182-1	B	1003063-48	1003064-94		1003079-21	1003081-25	F	1

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND1002005
3. A.R. DENOTES AS REQUIRED
4. CUT 3V BUSS BETWEEN GATES 87 & 85



VIEW B-B
SCALE: NONE
TYP FOR MODULES A17, A18, A21 THRU A38
SHOWING LOCATION OF JUMPER WIRES ONLY

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1006787-2	WIRE ELECTRICAL .020 DIA	11
AR	1006776-21	INSULATION, SLEEVING	10
1	SEE CHART	INSULATOR, STICK	9
1	SEE CHART	INSULATOR, STICK	8
1	SEE CHART	.800 MATRIX ASSEMBLY (7)	7
1	SEE CHART	.800 MATRIX ASSEMBLY (5)	6
1	SEE CHART	1.400 MATRIX ASSEMBLY (3)	5
A.R.	1006757-7	WIRE, ELEC NICKEL .005 X .020	4
A.R.	1015402	WIRE, ELEC KOVAR	3
—	SEE CHART	GROUND PLANE	2
1	SEE CHART	TO-47 HOUSING SUB-ASSEMBLY (ODD)	1

LIST OF MATERIALS

1003074-		
NEXT ASSY	USED ON	
APPLICATION		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT
DRAWN DATE
CHECKED 3/5/63
APPROVAL 3/5/63
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MICRO-LOGIC MODULE SUB-ASSEMBLY (ODD)
(TABULATED)

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003081
SCALE 4/1
WT
SHEET 1 OF 1

MASTER

1003081 G

INCHES
PHOTOGRAPHIC SCALE ONLY

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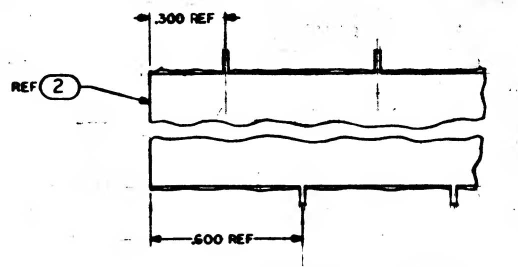
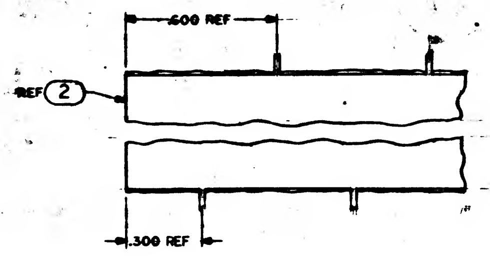
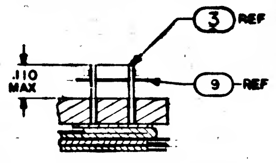
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED / UPGRADED TO CLASS A PER TDRR 00699	16 Apr 63	WR
B	REVISED PER TDRR 01742	6/4/63	WR
C	REVISED PER TDRR 03044	7/24/63	
D	REVISED PER TDRR 03435	9-26-63	
E	REVISED PER TDRR 03588	10-3-63	WR
F	REVISED PER TDRR 04032	10-17-63	WR
G	REVISED PER TDRR 00395		WR
H	REDRAWN WITH CHANGES PER TDRR 04926	12-6-63	



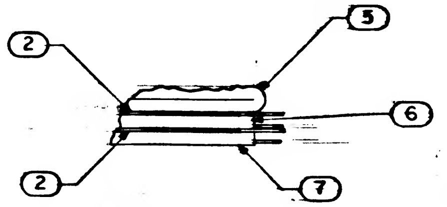
SECTION A-A



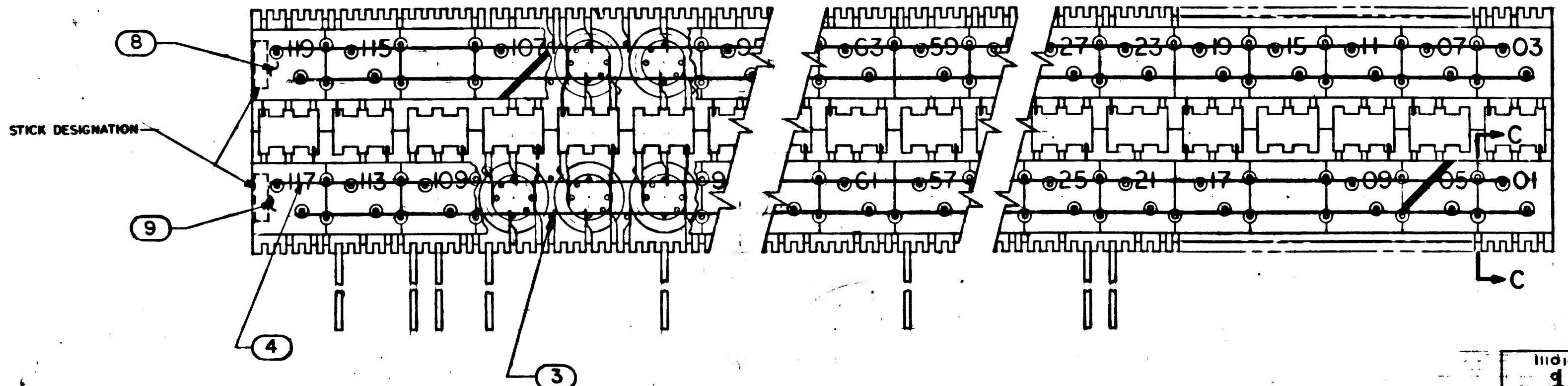
SECTION B-B

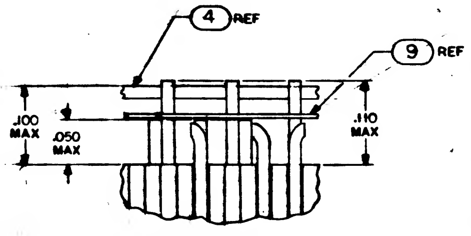


SECTION C-C
TYPICAL FOR ALL LOCATIONS OF FIND NO. 3

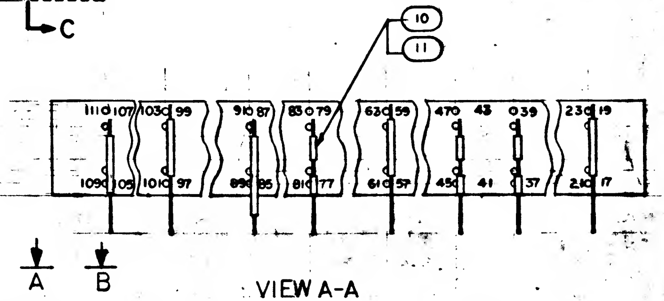


DETAIL A
SCALE 10/1

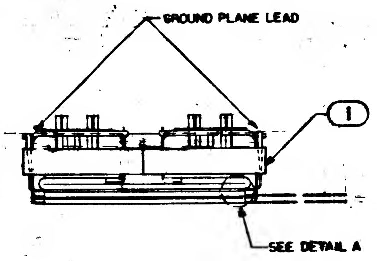


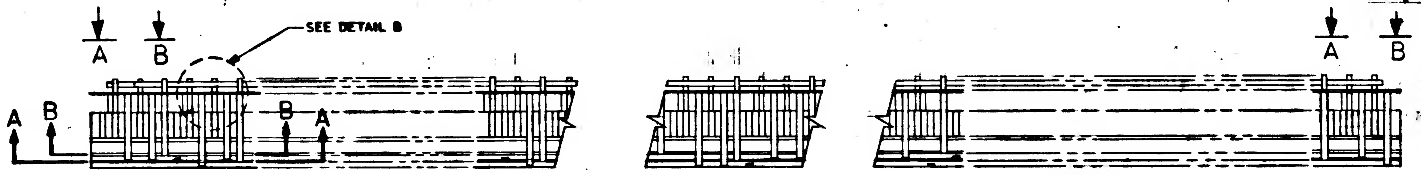


DETAIL B
SCALE 10/1



VIEWS SHOWN ARE TYPICAL AND ARE NOT ANY SPECIFIC STICK





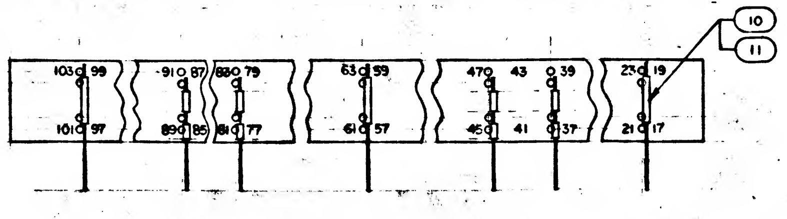
VIEW A-A
SCALE: NONE
TYP FOR MODULES A1 THRU A16 SHOWING LOCATION OF JUMPER WIRES ONLY
SEE NOTE 4

INACTIVE

(H) REPLACED BY REV J WITH CHANGES

MODULE NO.	INSULATOR FIND NO. 8	REV	INSULATOR FIND NO. 9	REV	MATRIX 3 FIND NO. 5	MATRIX 5 FIND NO. 6	MATRIX 7 FIND NO. 7	TO-47 HOUSING FIND NO. 1	PART NO.	REV	QUANTITY OF FIND NO. 2
A1—A16	1004170-3		1004170-1		1003063-2	1003064-3		1003079-1	1003081-1	F	1
~~A17~~	~~1004173-3~~		~~1004173-1~~		~~1003063-8~~	~~1003064-16~~		~~1003079-2~~	~~1003081-2~~		
~~A18~~	~~1004172-3~~		~~1004172-1~~		~~1003063-6~~	~~1003064-11~~		~~1003079-3~~	~~1003081-3~~		
A21	1004186-3		1004186-1		1003063-34	1003064-67	1003064-68	1003079-4	1003081-4	F	2
A22	1004183-3		1004183-1		1003063-28	1003064-55	1003064-56	1003079-5	1003081-5	F	2
A23	1004175-3		1004175-1		1003063-12	1003064-59		1003079-6	1003081-6	F	1
A24	1004185-3		1004185-1		1003063-32	1003064-63	1003064-64	1003079-7	1003081-7	F	2
A25	1004184-3		1004184-1		1003063-30	1003064-23		1003079-8	1003081-8	F	1
A26	1004179-3		1004179-1		1003063-20	1003064-39		1003079-9	1003081-9	F	1
~~A27~~	~~1004174-3~~		~~1004174-1~~		~~1003063-10~~	~~1003064-19~~		~~1003079-10~~	~~1003081-10~~		
~~A28~~	~~1004182-3~~		~~1004182-1~~		~~1003063-26~~	~~1003064-51~~		~~1003079-11~~	~~1003081-11~~		
A29	1004189-3		1004189-1		1003063-38	1003064-75		1003079-12	1003081-12	F	1
A30—A31	1004178-3		1004178-1		1003063-18	1003064-35		1003079-13	1003081-13	F	1
A32	1004176-3		1004176-1		1003063-14	1003064-27		1003079-14	1003081-14	F	1
A33—A34	1004177-3		1004177-1		1003063-16	1003064-31		1003079-15	1003081-15	F	1
A35	1004171-3		1004171-1		1003063-4	1003064-7		1003079-16	1003081-16	F	1
~~A36~~	~~1004187-3~~		~~1004187-1~~		~~1003063-36~~	~~1003064-71~~		~~1003079-17~~	~~1003081-17~~		
~~A37~~	~~1004180-3~~		~~1004180-1~~		~~1003063-22~~	~~1003064-43~~		~~1003079-18~~	~~1003081-18~~	F	1
A38	1004181-3		1004181-1		1003063-24	1003064-47		1003079-19	1003081-19	F	1
A37	1004180-3	A	1004180-1	A	1003063-22	1003064-76		1003079-18	1003081-20	F	1
A36	1004187-3		1004187-1	B	1003063-40	1003064-78		1003079-20	1003081-21	F	1
A18	1004172-3	B	1004172-1	B	1003063-42	1003064-89		1003079-3	1003081-22	F	1
A27	1004174-3	A	1004174-1		1003063-46	1003064-19		1003079-10	1003081-23	F	1
A17	1004173-3		1004173-1		1003063-8	1003064-92		1003079-2	1003081-24	F	1
A28	1004182-3	B	1004182-1	B	1003063-48	1003064-94		1003079-21	1003081-25	F	1

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND1002005
3. A.R. DENOTES AS REQUIRED
4. CUT 3V BUSS BETWEEN GATES 87 & 83



VIEW B-B
SCALE: NONE
TYP FOR MODULES A17, A18, A21 THRU A38 SHOWING LOCATION OF JUMPER WIRES ONLY

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1006787-2	WIRE ELECTRICAL .020 DIA	11
AR	1006776-21	INSULATION, SLEEVING	10
1	SEE CHART	INSULATOR, STICK	9
1	SEE CHART	INSULATOR, STICK	8
1	SEE CHART	.800 MATRIX ASSEMBLY (7)	7
1	SEE CHART	.800 MATRIX ASSEMBLY (5)	6
1	SEE CHART	1.400 MATRIX ASSEMBLY (3)	5
A.R.	1006757-7	WIRE, ELEC NICKEL .005 X .020	4
A.R.	1015402	WIRE, ELEC KOVAR	3
—	SEE CHART	GROUND PLANE	2
1	SEE CHART	TO-47 HOUSING SUB-ASSEMBLY, (OD)	1

LIST OF MATERIALS

1003074-	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± — DECIMALS ± — ANGLES ± —
DO NOT SCALE THIS DRAWING
MATERIAL —
HEAT TREATMENT —
FINAL FINISH —

MIT INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG. NO. CONTRACT
DRAWN — DATE
CHECKED — 7/5/63
APPROVAL — 7/5/63
APPROVAL
NASA APPROVAL
MIT APPROVAL

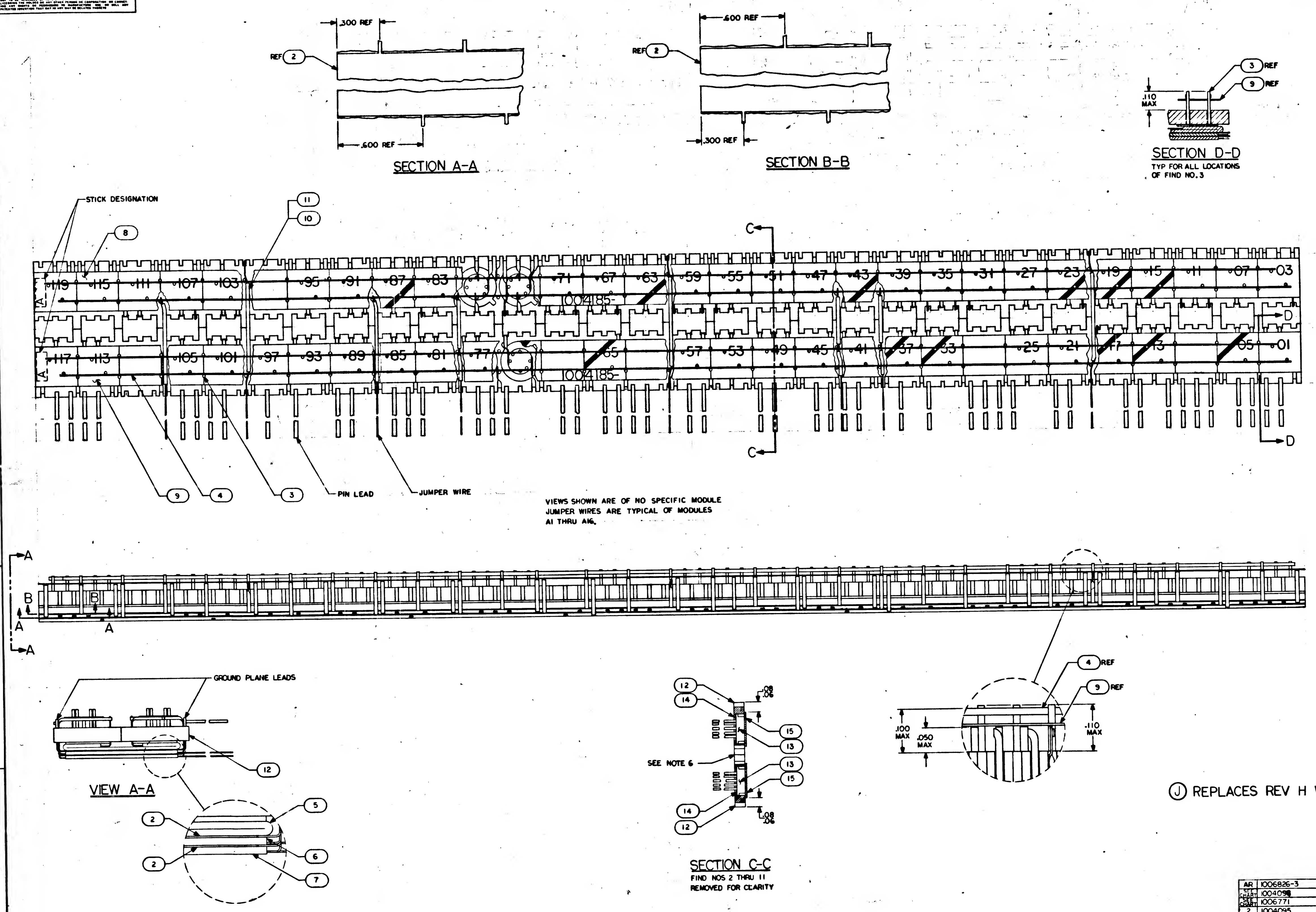
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MICRO LOGIC MODULE SUB ASSEMBLY (OUD)
(TABULATED)

CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003081
SCALE 4/1
WT
SHEET 1 OF 1

1003081 H

		REVISIONS	
SYM	DESCRIPTION	DATE	APPROVAL
J	REPLACES REV H WITH CHANGES PER TDRR 04926		



VIEWS SHOWN ARE OF NO SPECIFIC MODULE
JUMPER WIRES ARE TYPICAL OF MODULES
A1 THRU A16.

Ⓙ REPLACES REV H WITH CHANGES

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND1002005
3. AR DENOTES AS REQUIRED
4. CUT 3V BUSS BETWEEN GATES 87 AND 83
5. ▭ IN TABLE I SIGNIFIES FIND NO. 13 AND FIND NO. 14 TO BE OMITTED IN THIS POSITION
6. BOND HOUSINGS, FIND NO. 12 TOGETHER PER ND1002004, ORIENTING AS SHOWN

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1006826-3	INSULATION TAPE, ELECTRICAL	15
SEE CHART	1004098	WASHER, MYLAR	14
SEE CHART	1006771	MICRO-NOR GATE (TO-47)	13
2	1004095	HOUSING, MICROLOGIC (TO-47)	12
AR	1006757-8	WIRE, ELECTRICAL .020 DIA	11
AR	1006776-21	INSULATION, SLEEVING	10
1	SEE CHART I	INSULATOR, STICK	9
1	SEE CHART I	INSULATOR, STICK	8
1	SEE CHART I	.800 MATRIX ASSEMBLY (7)	7
1	SEE CHART I	.800 MATRIX ASSEMBLY (5)	6
1	SEE CHART I	1.400 MATRIX ASSEMBLY (3)	5
AR	1006757-7	WIRE, ELECTRICAL NICKEL .005 X.020	4
AR	1015402	WIRE, ELECTRICAL KOVAR	3
SEE CHART	1004100	GROUND PLANE	2
~~SEE CHART~~	~~SEE CHART~~	~~TO-47 HOUSING SUB ASSEMBLY (ODD)~~	~~1~~

LIST OF MATERIALS

NEXT ASSY	USED ON
1003174	
1003074	

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

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INSTRUMENTATION LAB
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DRAWN DATE
CHECKED
APPROVAL
APPROVAL
NASA APPROVAL
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MICRO LOGIC MODULE SUB ASSEMBLY (ODD) (TABULATED)

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003081
SCALE 4/1
WT
SHEET 1 OF 3

MASTER

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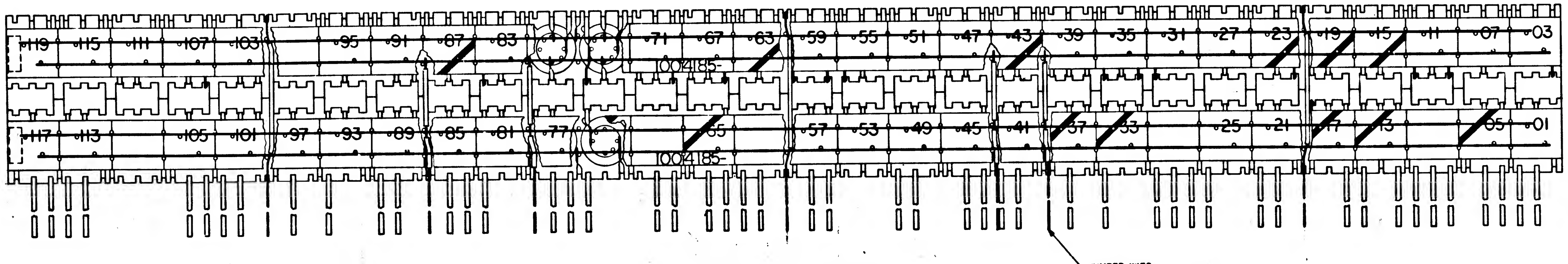
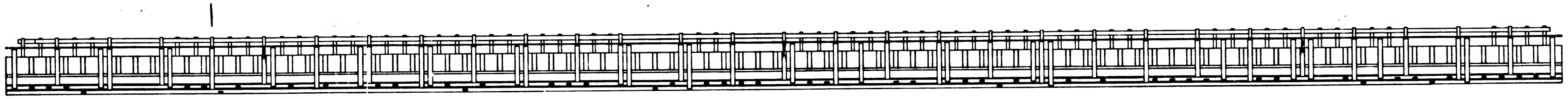
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
J	REPLACES REV H WITH CHANGES PER TDRR 04926	11-10-65	



VIEWS SHOWN ARE OF NO SPECIFIC MODULE.
JUMPER WIRES ARE TYPICAL OF MODULES
A17, A18, A21 THRU A38



Ⓙ REPLACES REV H WITH CHANGES

1003081

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT
DRAWN G. L. Dillman DATE 9-26-63
CHECKED R. P. Kingsbury
APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MICRO LOGIC MODULE
SUB ASSEMBLY (ODD)
(TABULATED)

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003081
SCALE 4/1
WT
SHEET 2 OF 3

INCHES
PHOTOGRAPHIC SCALE ONLY

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REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
J	REPLACES REV H WITH CHANGES PER TDRR 04926	12/16/63	

TABLE I

TABLE INDICATES LOADING OF HOUSING MODULES (FIND NO. 12) WITH MICRO NOR GATES (FIND NO. 13)
SEE NOTE 5

	MODULE NO.	A1-A16	A17	A18	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30-A31	A32	A33-A34	A35	A36	A37	A38	A36	A28			
POSITION NO.	01						X								X										
	03						X								X					X					
	05								X																
	07																								
	09			X			X	X					X												
	11						X																		
	13						X																		
	15						X																		
	17									X															
	19																								
	21		X				X						X												
	23															X									
	25			X																					
	27																								
	29						X	X					X		X										
	31																								
	33						X																		
	35																								
	37						X																		
	39						X																		
	41						X						X												
	43															X									
	45																								
	47																								
	49			X														X			X				
	51																								
	53												X												
	55																								
	57																								
	59																								
	61							X																	
	63																								
	65				X																				
	67																								
	69		X	X		X		X																	
	71																								
	73		X							X												X			
	75						X																		
	77																				X				
	79						X									X									
	81						X																		
	83																								
	85						X																		
	87						X					X													
	89		X		X		X												X						
	91																								
	93		X									X										X			
	95																								
	97											X										X			
	99							X																	
	101											X										X			
	103														X			X			X				
	105											X		X				X			X				
	107						X																		
	109			X				X				X			X		X					X			
	111																								
	113				X							X			X							X			
	115																								
	117											X			X							X			
	119				X										X										

CHART I

MODULE NO.	INSULATOR FIND NO. 8	INSULATOR FIND NO. 9	MATRIX 3 FIND NO. 5	MATRIX 5 FIND NO. 6	MATRIX 7 FIND NO. 7	PART NO.	REV	QUANTITY OF FIND NO. 2	SEE TABLE I FOR POSITION OF THESE COMPONENTS	
									QUANTITY OF FIND NO. 13	QUANTITY OF FIND NO. 14
A1-A16	1004170-3	1004170-1	1003063-2	1003064-3	X	1003081-1	F	1	60	60
~~A17~~	~~1004173-3~~	~~1004173-1~~	~~1003063-8~~	~~1003064-15~~	X	~~1003081-2~~			~~58~~	~~55~~
~~A18~~	~~1004172-3~~	~~1004172-1~~	~~1003063-6~~	~~1003064-11~~	X	~~1003081-3~~			~~56~~	~~56~~
A21	1004186-3	1004186-1	1003063-34	1003064-67	1003064-68	1003081-4	F	2	56	56
A22	1004183-3	1004183-1	1003063-28	1003064-55	1003064-56	1003081-5	F	2	59	59
A23	1004175-3	1004175-1	1003063-12	1003064-59	X	1003081-6	F	1	41	41
A24	1004185-3	1004185-1	1003063-32	1003064-63	1003064-64	1003081-7	F	2	54	54
A25	1004184-3	1004184-1	1003063-30	1003064-23	X	1003081-8	F	1	59	59
A26	1004179-3	1004179-1	1003063-20	1003064-39	X	1003081-9	F	1	58	58
~~A27~~	~~1004174-3~~	~~1004174-1~~	~~1003063-10~~	~~1003064-19~~	X	~~1003081-10~~			~~60~~	~~60~~
~~A28~~	~~1004182-3~~	~~1004182-1~~	~~1003063-26~~	~~1003064-51~~	X	~~1003081-11~~			~~52~~	~~52~~
A29	1004189-3	1004189-1	1003063-38	1003064-75	X	1003081-12	F	1	55	55
A30-A31	1004178-3	1004178-1	1003063-18	1003064-35	X	1003081-13	F	1	59	59
A32	1004176-3	1004176-1	1003063-14	1003064-27	X	1003081-14	F	1	52	52
A33-A34	1004177-3	1004177-1	1003063-16	1003064-31	X	1003081-15	F	1	57	57
A35	1004171-3	1004171-1	1003063-4	1003064-7	X	1003081-16	F	1	59	59
~~A36~~	~~1004187-3~~	~~1004187-1~~	~~1003063-36~~	~~1003064-71~~	X	~~1003081-17~~			~~57~~	~~57~~
~~A37~~	~~1004180-3~~	~~1004180-1~~	~~1003063-22~~	~~1003064-43~~	X	~~1003081-18~~	~~F~~	~~1~~	[illegible]	[illegible]
A38	1004181-3	1004181-1	1003063-24	1003064-47	X	1003081-19	F	1	59	59
A37	1004180-3	1004180-1	1003063-22	1003064-76	X	1003081-20	F	1	59	59
A36	1004187-3	1004187-1	1003063-40	1003064-78	X	1003081-21	F	1	56	56
A18	1004172-3	1004172-1	1003063-42	1003064-89	X	1003081-22	F	1	55	55
A27	1004174-3	1004174-1	1003063-46	1003064-19	X	1003081-23	F	1	60	60
A17	1004173-3	1004173-1	1003063-8	1003064-92	X	1003081-24	F	1	55	55
A28	1004182-3	1004182-1	1003063-48	1003064-94	X	1003081-25	F	1	53	53

Ⓙ REPLACES REV H WITH CHANGES

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG NO. CONTRACT
DRAWN DATE
CHECKED
APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

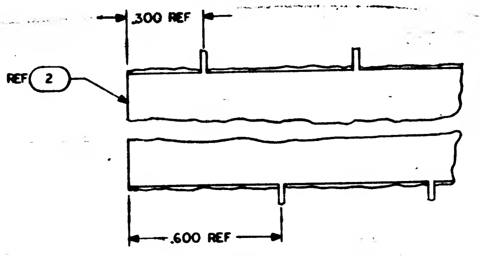
MICRO LOGIC MODULE
SUB ASSEMBLY (ODD)
(TABULATED)

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003081
SCALE 4/1
WT
SHEET 3 OF 3

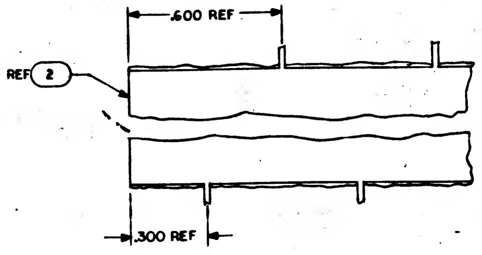
1003081

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

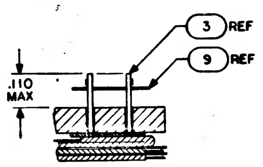
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
J	REPLACES REV H WITH CHANGES PER TDRR 04926		
K	REVISED PER TDRR 06024		



SECTION A-A

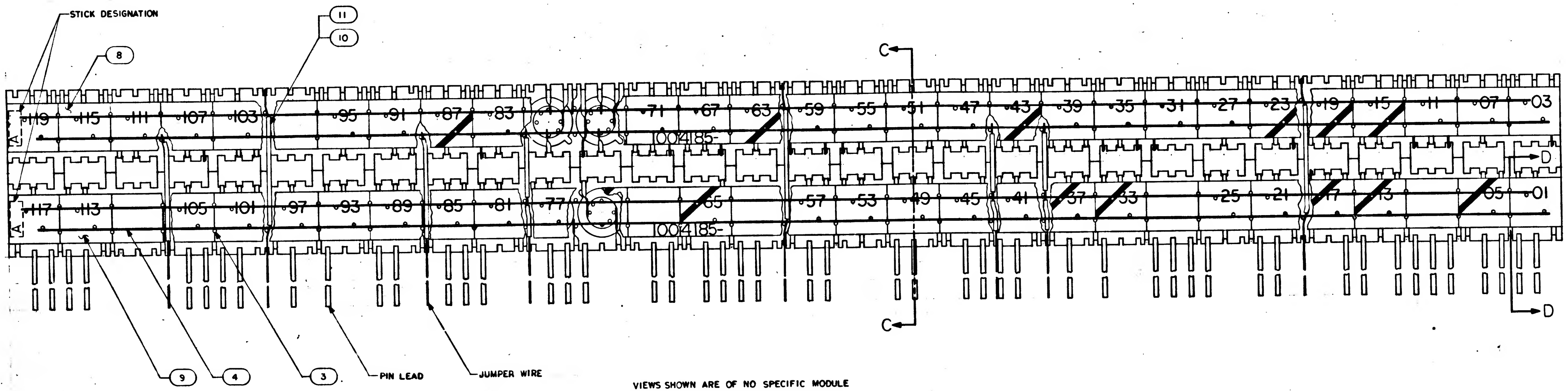


SECTION B-B

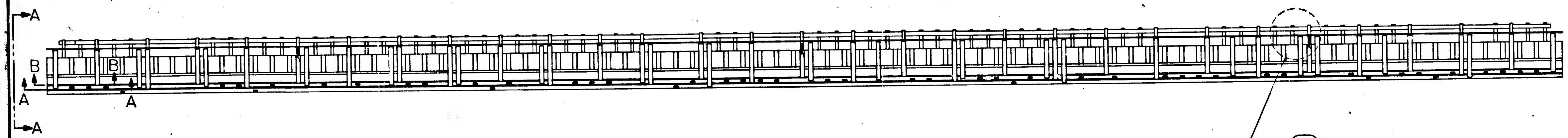


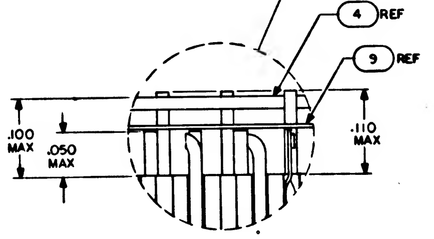
SECTION D-D

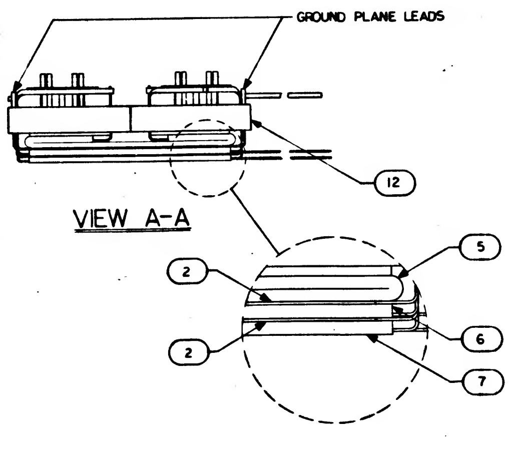
TYP FOR ALL LOCATIONS
OF FIND NO. 3



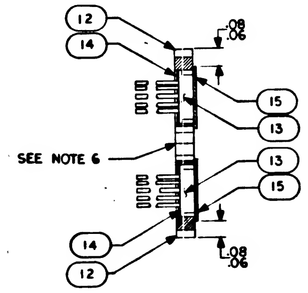
VIEWS SHOWN ARE OF NO SPECIFIC MODULE
JUMPER WIRES ARE TYPICAL OF MODULES
A1 THRU A16.







VIEW A-A



SECTION C-C

FIND NOS 2 THRU 11
REMOVED FOR CLARITY
SCALE: NONE

Ⓙ REPLACES REV H WITH CHANGES

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
AR	1006826-3	INSULATION TAPE, ELECTRICAL	15
SEE CHART	1004098	WASHER, MYLAR	14
SEE CHART	1006771	MICRO-NOR GATE (TO-47)	13
2	1004095	HOUSING, MICROLOGIC (TO-47)	12
AR	1006757-8	WIRE, ELECTRICAL .020 DIA	11
AR	1006776-21	INSULATION, SLEEVING	10
1	SEE CHART I	INSULATOR, STICK	9
1	SEE CHART I	INSULATOR, STICK	8
1	SEE CHART I	.800 MATRIX ASSEMBLY (7)	7
1	SEE CHART I	.800 MATRIX ASSEMBLY (5)	6
1	SEE CHART I	1.400 MATRIX ASSEMBLY (3)	5
AR	1006757-7	WIRE, ELECTRICAL NICKEL .005 X.020	4
AR	1015402	WIRE, ELECTRICAL KOVAR	3
SEE CHART	1004100	GROUND PLANE	2
~~SEE CHART~~	~~SEE CHART~~	~~TO-47 HOUSING SUB ASSEMBLY (ODD)~~	~~1~~

LIST OF MATERIALS

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND1002005
3. AR DENOTES AS REQUIRED
4. CUT 3V BUSS BETWEEN GATES 87 AND 83
5. ▭ IN TABLE I SIGNIFIES FIND NO. 13 AND FIND NO. 14 TO BE OMITTED IN THIS POSITION
6. BOND HOUSINGS, FIND NO. 12 TOGETHER PER ND1002004, ORIENTING AS SHOWN

MASTER

1003174	
1003074	
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
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MATERIAL
HEAT TREATMENT
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INSTRUMENTATION LAB
CAMBRIDGE MASS
DWG NO. CONTRACT
DRAWN DATE
CHECKED
APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

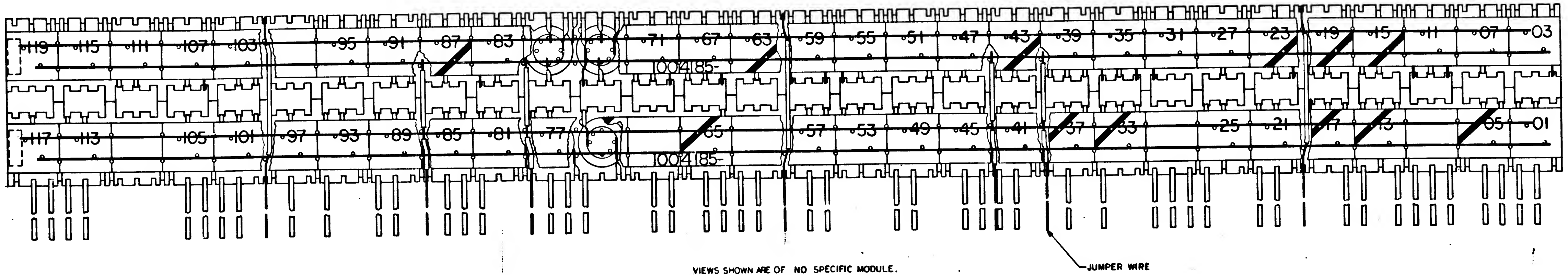
MICRO LOGIC MODULE
SUB ASSEMBLY (ODD)
(TABULATED)

CODE IDENT NO. SIZE E NASA DRAWING NO. 1003081
SCALE 4/1 WT SHEET 1 OF 3

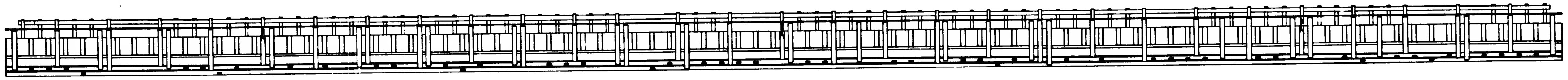
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
Ⓙ J	REPLACES REV H WITH CHANGES PER TDRR 04126	12-10-63	
K	REVISED PER TDRR 06024		



VIEWS SHOWN ARE OF NO SPECIFIC MODULE.
JUMPER WIRES ARE TYPICAL OF MODULES
A17, A18, A21 THRU A38



Ⓙ REPLACES REV K WITH CHANGES

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

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DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

M I T
INSTRUMENTATION LAB
CAMBRIDGE, MASS
DWG. NO. CONTRACT
DRAWN DATE 9-26-63
CHECKED
APPROVAL
APPROVAL 12-3-63
NASA APPROVAL 12/4/63
MIT APPROVAL 12/11/63

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MICRO LOGIC MODULE SUB ASSEMBLY (ODD)
(TABULATED)

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003081
SCALE 4/1
WT
SHEET 2 OF 3

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
J	REPLACES REV H WITH CHANGES PER TDRR 04926	12/16/63	
K	REVISED PER TDRR 06024	[illegible]	

TABLE I

TABLE INDICATES LOADING OF HOUSING MODULES (FIND NO. 12) WITH MICRO NOR GATES (FIND NO. 13)
SEE NOTE 5

POSITION NO.

MODULE NO.	A1-A16	A17	A18	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30-A31	A32	A33-A34	A35	A36	A37	A38	A36	A28			
01						X								X										
03						X								X					X					
05								X																
07																								
09			X			X	X					X												
11						X																		
13						X																		
15						X																		
17									X															
19																								
21		X				X						X												
23															X									
25			X																					
27																								
29						X	X					X		X										
31																								
33						X																		
35																								
37						X																		
39						X																		
41						X						X												
43															X									
45																								
47																								
49			X														X			X				
51																								
53												X												
55																								
57																								
59																								
61							X																	
63																								
65				X																				
67																								
69		X	X		X		X																	
71																								
73		X							X												X			
75						X																		
77																				X				
79						X						X			X									
81						X																		
83																								
85						X																		
87						X					X													
89		X		X		X												X						
91																								
93		X									X										X			
95																								
97											X										X			
99							X																	
101											X										X			
103														X			X			X				
105											X		X				X			X				
107						X																		
109			X				X				X			X		X					X			
111																								
113				X							X			X							X			
115																								
117											X			X							X			
119				X										X										

CHART I

MODULE NO.	INSULATOR FIND NO. 8	INSULATOR FIND NO. 9	MATRIX 3 FIND NO. 5	MATRIX 5 FIND NO. 6	MATRIX 7 FIND NO. 7	PART NO.	REV	QUANTITY OF FIND NO. 2	SEE TABLE I FOR POSITION OF THESE COMPONENTS QUANTITY OF FIND NO. 13	QUANTITY OF FIND NO. 14
A1-A16	1004170-3	1004170-1	1003063-2	1003064-3	X	1003081-1	K	1	60	60
~~A17~~	~~1004173-3~~	~~1004173-1~~	~~1003063-8~~	~~1003064-15~~	X	~~1003081-2~~			~~55~~	~~55~~
~~A18~~	~~1004172-3~~	~~1004172-1~~	~~1003063-6~~	~~1003064-11~~	X	~~1003081-3~~			~~55~~	~~55~~
A21	1004186-3	1004186-1	1003063-34	1003064-67	1003064-68	1003081-4	K	2	56	56
A22	1004183-3	1004183-1	1003063-28	1003064-55	1003064-56	1003081-5	K	2	59	59
A23	1004175-3	1004175-1	1003063-12	1003064-59	X	1003081-6	K	1	41	41
A24	1004185-3	1004185-1	1003063-32	1003064-63	1003064-64	1003081-7	K	2	54	54
A25	1004184-3	1004184-1	1003063-30	1003064-23	X	1003081-8	K	1	59	59
A26	1004179-3	1004179-1	1003063-20	1003064-39	X	1003081-9	K	1	58	58
~~A27~~	~~1004174-3~~	~~1004174-1~~	~~1003063-10~~	~~1003064-19~~	X	~~1003081-10~~			~~60~~	~~60~~
~~A28~~	~~1004182-3~~	~~1004182-1~~	~~1003063-26~~	~~1003064-51~~	X	~~1003081-11~~			~~52~~	~~52~~
A29	1004189-3	1004189-1	1003063-38	1003064-75	X	1003081-12	K	1	54	54
A30-A31	1004178-3	1004178-1	1003063-18	1003064-35	X	1003081-13	K	1	59	59
A32	1004176-3	1004176-1	1003063-14	1003064-27	X	1003081-14	K	1	52	52
A33-A34	1004177-3	1004177-1	1003063-16	1003064-31	X	1003081-15	K	1	57	57
A35	1004171-3	1004171-1	1003063-4	1003064-7	X	1003081-16	K	1	59	59
~~A36~~	~~1004187-3~~	~~1004187-1~~	~~1003063-36~~	~~1003064-71~~	X	~~1003081-17~~			~~57~~	~~57~~
~~A37~~	~~1004180-3~~	~~1004180-1~~	~~1003063-22~~	~~1003064-43~~	X	~~1003081-18~~	~~F~~	~~1~~	~~59~~	~~59~~
A38	1004181-3	1004181-1	1003063-24	1003064-47	X	1003081-19	K	1	59	59
A37	1004180-3	1004180-1	1003063-22	1003064-76	X	1003081-20	K	1	59	59
A36	1004187-3	1004187-1	1003063-40	1003064-78	X	1003081-21	K	1	56	56
A18	1004172-3	1004172-1	1003063-42	1003064-89	X	1003081-22	K	1	55	55
A27	1004174-3	1004174-1	1003063-46	1003064-19	X	1003081-23	K	1	60	60
A17	1004173-3	1004173-1	1003063-8	1003064-92	X	1003081-24	K	1	55	55
A28	1004182-3	1004182-1	1003063-48	1003064-94	X	1003081-25	K	1	53	53
							K			
							K			

Ⓙ REPLACES REV H WITH CHANGES . . .

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMALS ± ANGLES ±
DO NOT SCALE THIS DRAWING
MATERIAL
HEAT TREATMENT
FINAL FINISH

MIT
INSTRUMENTATION LAB
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DWG NO. CONTRACT
DRAWN DATE
CHECKED
APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL

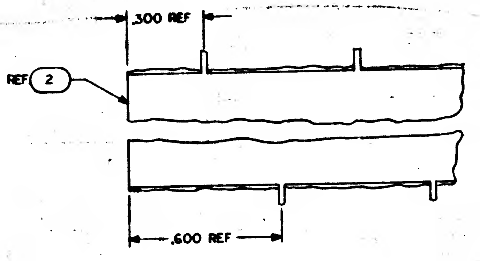
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MICRO LOGIC MODULE
SUB ASSEMBLY (ODD)
(TABULATED)

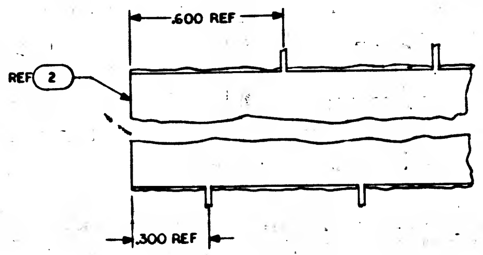
CODE IDENT NO | SIZE E | NASA DRAWING NO. 1003081
SCALE 4/1 | WT | SHEET 3 OF 3

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

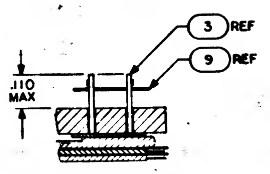
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
J	REPLACES REV H WITH CHANGES PER TDRR 04926	[illegible]	[illegible]
K	REVISED PER TDRR 06024	29 Jan [illegible]	[illegible]
L	REVISED PER TDRR 06315	2/10/64	[illegible]
M	REVISED PER TDRR 06147	3/4/64	[illegible]



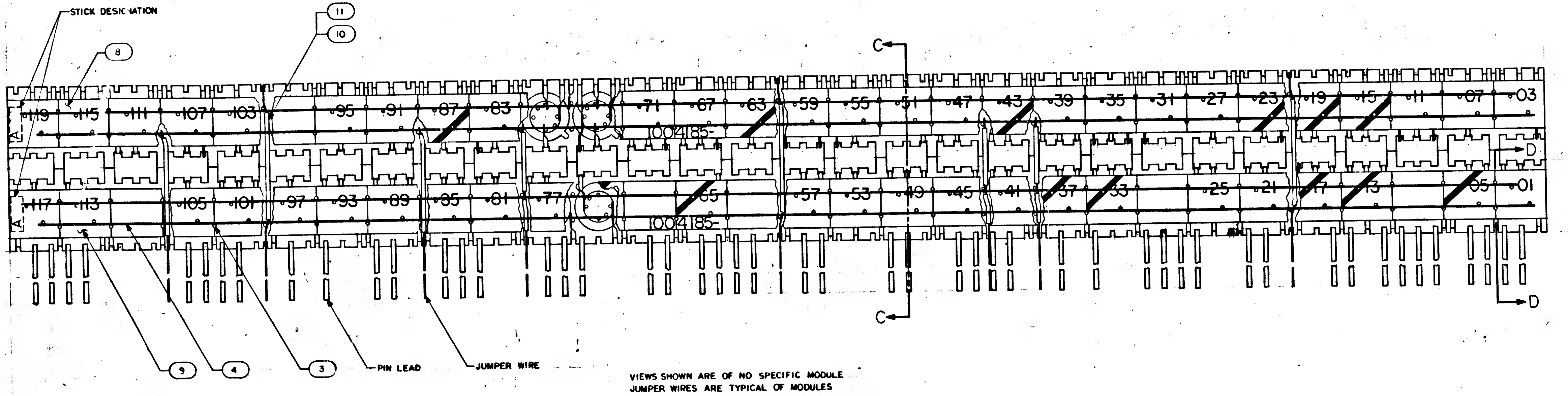
SECTION A-A



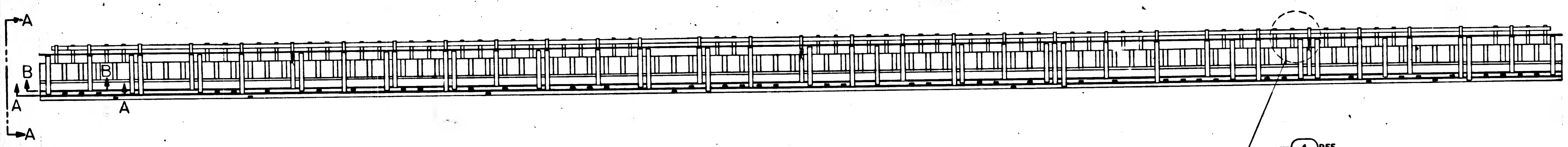
SECTION B-B

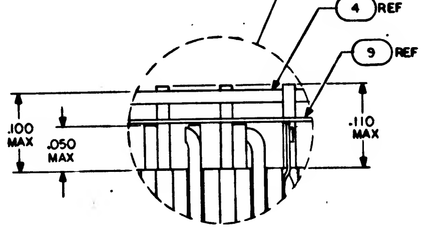


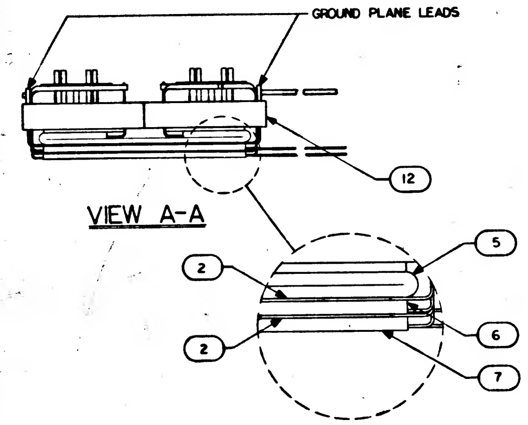
SECTION D-D
TYP FOR ALL LOCATIONS
OF FIND NO. 3



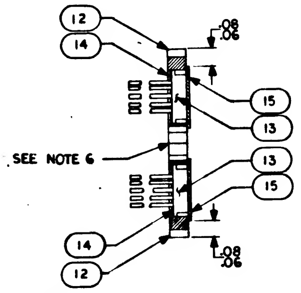
VIEWS SHOWN ARE OF NO SPECIFIC MODULE
JUMPER WIRES ARE TYPICAL OF MODULES
A1 THRU A16.







VIEW A-A



SECTION C-C
FIND NOS 2 THRU 11
REMOVED FOR CLARITY
SCALE: NONE

Ⓙ REPLACES REV H WITH CHANGES

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND1002005
3. AR DENOTES AS REQUIRED
4. CUT 3V BUSS BETWEEN GATES 87 AND 83
5. ▭ IN TABLE I SIGNIFIES FIND NO. 13 AND FIND NO. 14 TO BE OMITTED IN THIS POSITION
6. BOND HOUSINGS, FIND NO. 12 TOGETHER PER ND1002004, ORIENTING AS SHOWN

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1006826-3	INSULATION TAPE, ELECTRICAL	15
SEE CHART	1004098	WASHER, MYLAR	14
SEE CHART	1006771	MICRO-NOR GATE (TO-47)	13
2	1004095	HOUSING, MICROLOGIC (TO-47)	12
AR	1006757-8	WIRE, ELECTRICAL .020 DIA	11
AR	1006776-21	INSULATION, SLEEVING	10
1	SEE CHART I	INSULATOR, STICK	9
1	SEE CHART I	INSULATOR, STICK	8
1	SEE CHART I	.800 MATRIX ASSEMBLY (7)	7
1	SEE CHART I	.800 MATRIX ASSEMBLY (5)	6
1	SEE CHART I	1.400 MATRIX ASSEMBLY (3)	5
AR	1006757-7	WIRE, ELECTRICAL NICKEL .005 X.020	4
AR	1015402	WIRE, ELECTRICAL KOVAR	3
SEE CHART	1004100	GROUND PLANE	2
~~SEE CHART~~	~~SEE CHART~~	~~TO-47 HOUSING SUB ASSEMBLY (ODD)~~	~~1~~

LIST OF MATERIALS

NEXT ASSY	USED ON
1003174	
1003074	

APPLICATION

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FRACTIONS ± DECIMALS ± ANGLES ±
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DRAWN [illegible] DATE [illegible]
CHECKED [illegible]
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APPROVAL [illegible]
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MICRO LOGIC MODULE SUB ASSEMBLY (ODD) (TABULATED)

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003081
SCALE 4/1 WT SHEET 1 OF 3

1003081 M

MASTER

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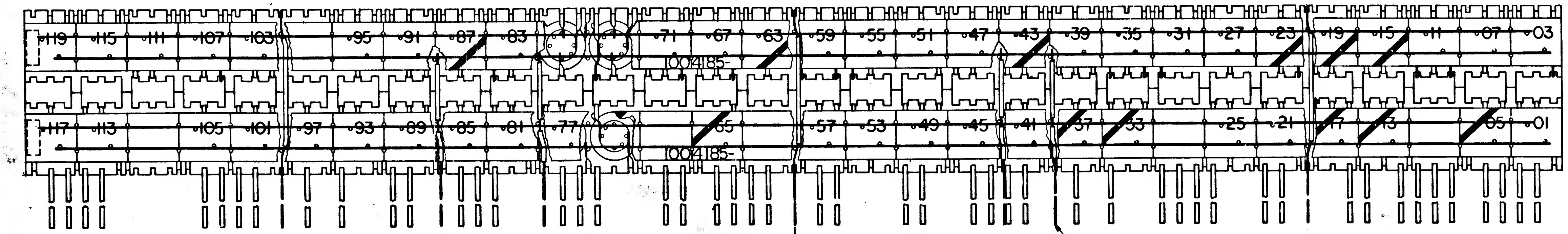
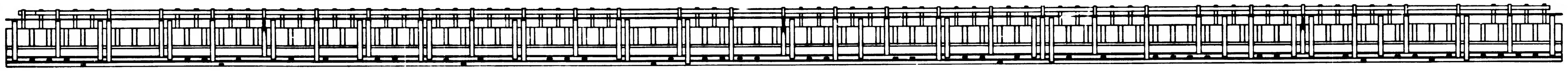
REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
J	REPLACES REV H WITH CHANGES PER TDRR 04986	[illegible]	[illegible]
K	REVISED PER TDRR 06024	[illegible]	[illegible]
L	REVISED PER TDRR 06315	7/11/64	[illegible]
M	REVISED PER TDRR 06147	7/9/64	[illegible]



VIEWS SHOWN ARE OF NO SPECIFIC MODULE.
JUMPER WIRES ARE TYPICAL OF MODULES
A17, A18, A21 THRU A38



Ⓙ REPLACES REV K WITH CHANGES

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON
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APPROVAL [illegible]
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MICRO LOGIC MODULE
SUB ASSEMBLY (ODD)
(TABULATED)

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003081
SCALE 4/1
WT
SHEET 2 OF 3

1003081 M

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REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
J	REPLACES REV H WITH CHANGES PER TDRR 01926		
K	REVISED PER TDRR 06024		
L	REVISED PER TDRR 06315	3/11/64	RPK
M	REVISED PER TDRR 06147	3/4/64	RPK

TABLE I

TABLE INDICATES LOADING OF HOUSING MODULES (FIND NO. 12) WITH MICRO NOR GATES (FIND NO. 13)
SEE NOTE 5

MODULE NO.		A1-A16	A17	A18	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30-A31	A32	A33-A34	A35	A36	A37	A38	A36	A28			
POSITION NO.	01						X								X										
	03						X								X					X					
	05								X																
	07																								
	09			X			X	X					X												
	11						X																		
	13						X																		
	15						X																		
	17									X															
	19																								
	21		X				X						X												
	23															X									
	25			X																					
	27																								
	29						X	X					X		X										
	31																								
	33						X																		
	35																								
	37						X																		
	39						X																		
	41						X						X												
	43															X									
	45																								
	47																								
	49			X														X			X				
	51																								
	53												X												
	55																								
	57																								
	59																								
	61							X																	
	63																								
	65																								
	67																								
	69		X	X		X		X																	
	71																								
	73		X							X												X			
	75						X																		
	77																				X				
	79						X						X			X									
	81						X																		
	83																								
	85						X																		
	87						X					X													
	89		X		X		X												X						
	91																								
	93		X									X										X			
	95																								
	97											X										X			
	99							X																	
	101											X										X			
	103														X			X			X				
	105											X		X				X			X				
	107						X																		
	109			X				X				X			X		X					X			
	111																								
	113				X							X			X							X			
	115																								
	117											X			X							X			
	119				X										X										

CHART I

MODULE NO.	INSULATOR FIND NO. 8	INSULATOR FIND NO. 9	MATRIX 3 FIND NO. 5	MATRIX 5 FIND NO. 6	MATRIX 7 FIND NO. 7	PART NO.	REV	QUANTITY OF FIND NO. 2	SEE TABLE I FOR POSITION OF THESE COMPONENTS	
									QUANTITY OF FIND NO. 13	QUANTITY OF FIND NO. 14
A1-A16	1004170-3	1004170-1	1003063-2	1003064-3		1003081-1	K	1	60	60
~~A17~~	~~1004173-3~~	~~1004173-1~~	~~1003063-8~~	~~1003064-15~~		~~1003081-2~~			~~58~~	~~55~~
~~A18~~	~~1004172-3~~	~~1004172-1~~	~~1003063-6~~	~~1003064-11~~		~~1003081-3~~			~~56~~	~~56~~
~~A21~~	~~1004186-3~~	~~1004186-1~~	~~1003063-34~~	~~1003064-67~~	~~1003064-68~~	~~1003081-4~~	~~K~~	~~2~~	~~56~~	~~56~~
A22	1004183-3	1004183-1	1003063-28	1003064-55	1003064-56	1003081-5	K	2	59	59
A23	1004175-3	1004175-1	1003063-12	1003064-59		1003081-6	K	1	41	41
A24	1004185-3	1004185-1	1003063-32	1003064-63	1003064-64	1003081-7	K	2	54	54
A25	1004184-3	1004184-1	1003063-30	1003064-23		1003081-8	K	1	59	59
A26	1004179-3	1004179-1	1003063-20	1003064-39		1003081-9	K	1	58	58
~~A27~~	~~1004174-3~~	~~1004174-1~~	~~1003063-10~~	~~1003064-19~~		~~1003081-10~~			~~60~~	~~60~~
~~A28~~	~~1004182-3~~	~~1004182-1~~	~~1003063-26~~	~~1003064-51~~		~~1003081-11~~			~~52~~	~~52~~
~~A29~~	~~1004189-3~~	~~1004189-1~~	~~1003063-38~~	~~1003064-75~~		~~1003081-12~~	~~K~~	~~1~~	~~54~~	~~54~~
A30-A31	1004178-3	1004178-1	1003063-18	1003064-35		1003081-13	K	1	59	59
A32	1004176-3	1004176-1	1003063-14	1003064-27		1003081-14	K	1	52	52
A33-A34	1004177-3	1004177-1	1003063-16	1003064-31		1003081-15	K	1	57	57
A35	1004171-3	1004171-1	1003063-4	1003064-7		1003081-16	K	1	59	59
~~A36~~	~~1004187-3~~	~~1004187-1~~	~~1003063-36~~	~~1003064-71~~		~~1003081-17~~			~~57~~	~~57~~
~~A37~~	~~1004180-3~~	~~1004180-1~~	~~1003063-22~~	~~1003064-43~~		~~1003081-18~~	~~F~~	~~1~~	~~59~~	~~59~~
A38	1004181-3	1004181-1	1003063-24	1003064-47		1003081-19	K	1	59	59
A37	1004180-3	1004180-1	1003063-22	1003064-76		1003081-20	K	1	59	59
A36	1004187-3	1004187-1	1003063-40	1003064-78		1003081-21	K	1	56	56
A18	1004172-3	1004172-1	1003063-42	1003064-89		1003081-22	K	1	55	55
A27	1004174-3	1004174-1	1003063-46	1003064-19		1003081-23	K	1	60	60
A17	1004173-3	1004173-1	1003063-8	1003064-92		1003081-24	K	1	55	55
A28	1004182-3	1004182-1	1003063-48	1003064-94		1003081-25	K	1	53	53
A21	1004186-3	1004186-5	1003063-49	1003064-95	1003064-68	1003081-26	L	2	57	57
A29	1004189-5	1004189-1	1003063-38	1003064-75		1003081-27	M	1	54	54

Ⓙ REPLACES REV H WITH CHANGES

1003081 M

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
LIST OF MATERIALS			

NEXT ASSY	USED ON
APPLICATION	

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MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MICRO LOGIC MODULE
SUB ASSEMBLY (ODD)
(TABULATED)

CODE IDENT NO. | SIZE E | NASA DRAWING NO. 1003081
SCALE 4/1 | WT | SHEET 3 OF 3

INCHES
PHOTOGRAPHIC SCALE ONLY

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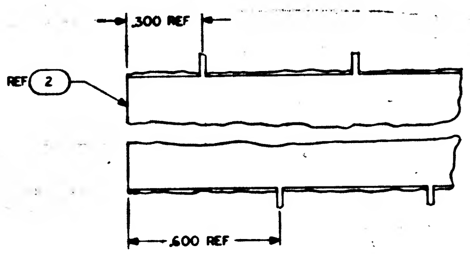
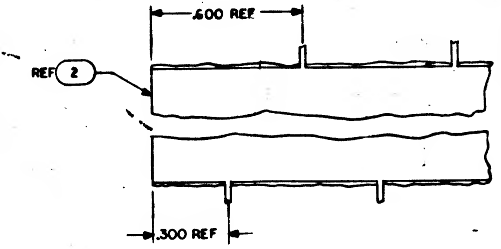
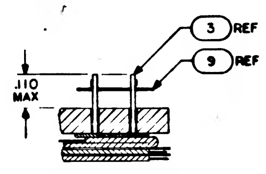
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
J	REPLACES REV H WITH CHANGES PER TDRR 04926		
K	REVISED PER TDRR 06024		
L	REVISED PER TDRR 06315	2/10/64	
M	REVISED PER TDRR 06147		
N	REVISED PER TDRR 07262 DR CHK	3/24/64	



SECTION A-A

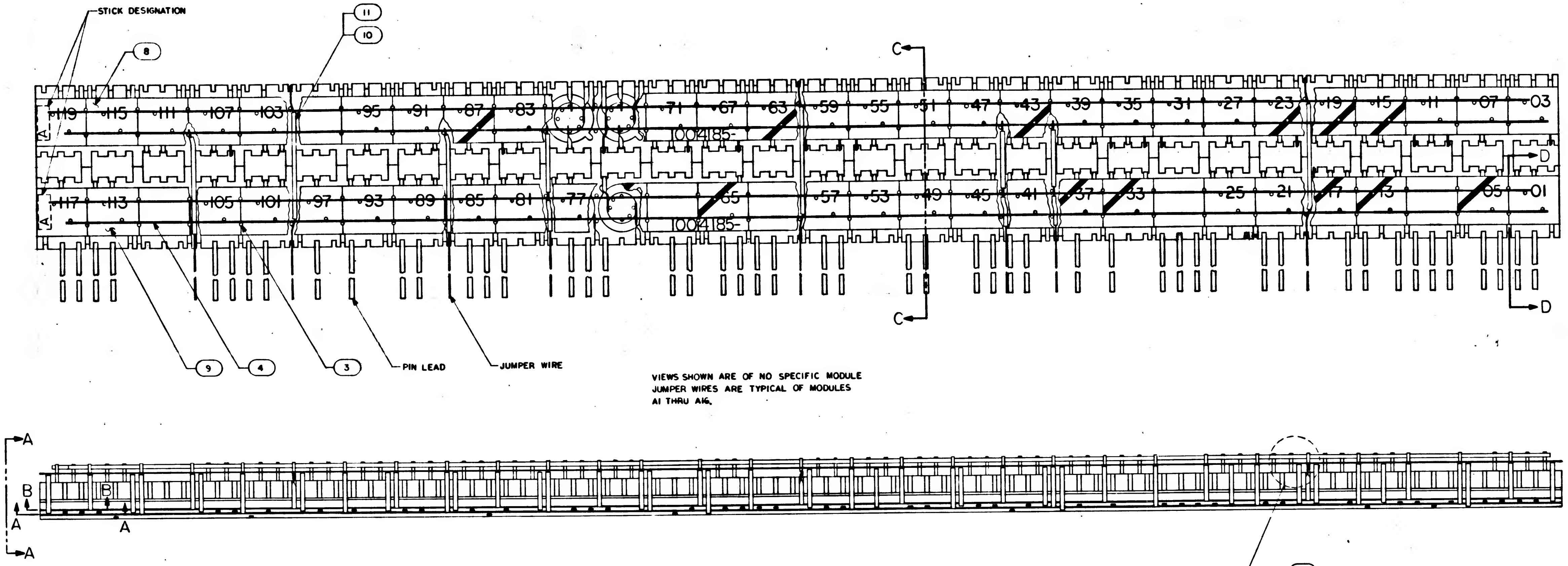


SECTION B-B

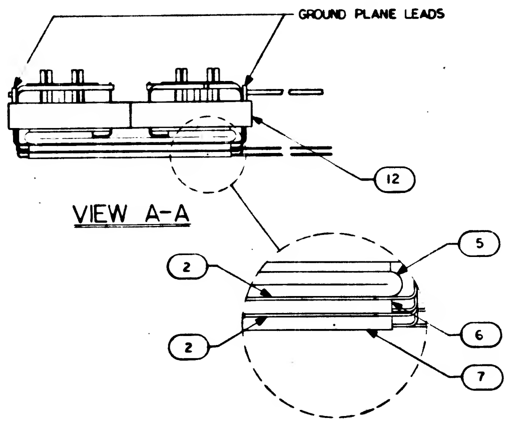


SECTION D-D

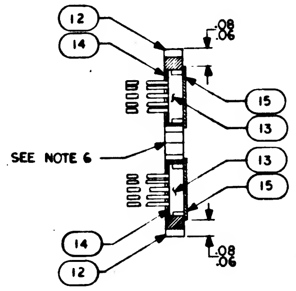
TYP FOR ALL LOCATIONS OF FIND NO. 3



VIEWS SHOWN ARE OF NO SPECIFIC MODULE
JUMPER WIRES ARE TYPICAL OF MODULES
A1 THRU A16.

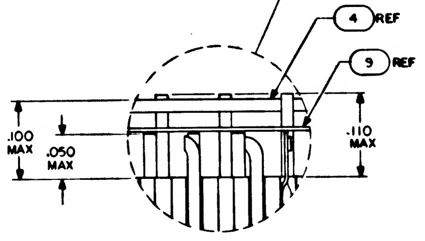


VIEW A-A



SECTION C-C

FIND NOS 2 THRU 11
REMOVED FOR CLARITY
SCALE: NONE



Ⓙ REPLACES REV H WITH CHANGES

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND1002005
3. AR DENOTES AS REQUIRED
4. CUT 3V BUSS BETWEEN GATES 87 AND 83
5. ▭ IN TABLE I SIGNIFIES FIND NO. 13 AND FIND NO. 14 TO BE OMITTED IN THIS POSITION
6. BOND HOUSINGS, FIND NO. 12 TOGETHER PER ND1002004, ORIENTING AS SHOWN

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1006826-3	INSULATION TAPE, ELECTRICAL	15
SEE CHART	1004627	INSULATOR	14
SEE CHART	1006771	MICRO-NOR GATE (TO-47)	13
2	1004095	HOUSING, MICROLOGIC (TO-47)	12
AR	1006757-8	WIRE, ELECTRICAL .020 DIA	11
AR	1006776-21	INSULATION, SLEEVING	10
1	SEE CHART I	INSULATOR, STICK	9
1	SEE CHART I	INSULATOR, STICK	8
1	SEE CHART I	.800 MATRIX ASSEMBLY (7)	7
1	SEE CHART I	.800 MATRIX ASSEMBLY (5)	6
1	SEE CHART I	1.400 MATRIX ASSEMBLY (3)	5
AR	1006757-7	WIRE, ELECTRICAL NICKEL .005 X .020	4
AR	1015402	WIRE, ELECTRICAL KOVAR	3
SEE CHART	1004100	GROUND PLANE	2
~~SEE CHART~~	~~SEE CHART~~	~~TO-47 HOUSING SUB ASSEMBLY (ODD)~~	~~1~~

LIST OF MATERIALS

1003174	
1003074	
NEXT ASSY	USED ON
APPLICATION	

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CHECKED
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APPROVAL
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MICRO LOGIC MODULE SUB ASSEMBLY (ODD) (TABULATED)

CODE IDENT NO. ——
SIZE E
NASA DRAWING NO. 1003081
SCALE 4/1
WT
SHEET 1 OF 3

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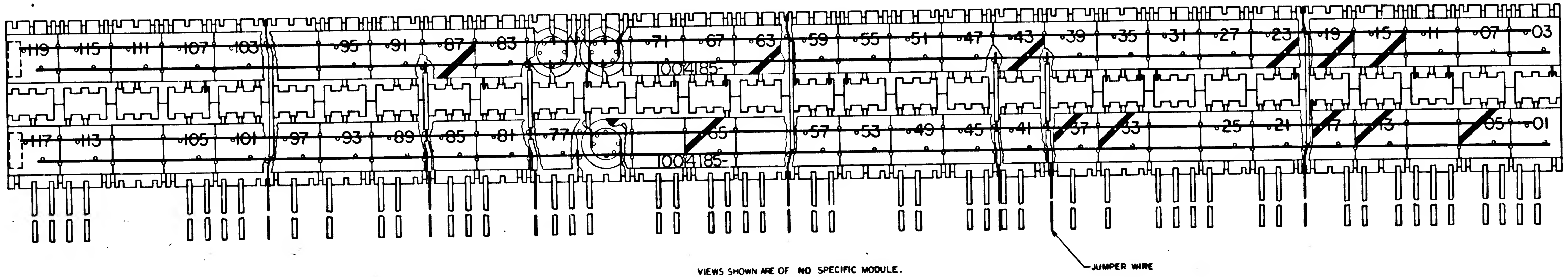
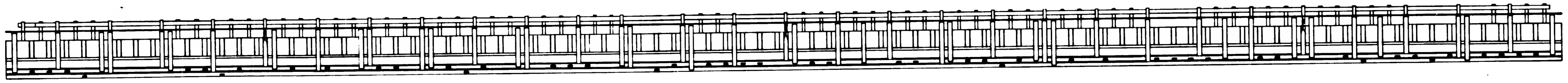
REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
J	REPLACES REV H WITH CHANGES PER TDRR 04926	12-10-63	
K	REVISED PER TDRR 06224		
L	REVISED PER TDRR 06315	4/11/64	
M	REVISED PER TDRR 06147	4/4/64	
N	REVISED PER TDRR 07262 DR CHK	3/23/64	



VIEWS SHOWN ARE OF NO SPECIFIC MODULE.
JUMPER WIRES ARE TYPICAL OF MODULES A17, A18, A21 THRU A38



Ⓙ REPLACES REV H WITH CHANGES

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

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(TABULATED)

CODE IDENT NO. —— SIZE E NASA DRAWING NO. 1003081
SCALE 4/1 WT SHEET 2 OF 3

1003081 N

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REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
J	REPLACES REV H WITH CHANGES PER TDRR 07226		
K	REVISED PER TDRR 06024		
L	REVISED PER TDRR 06315	3/11/64	
M	REVISED PER TDRR 06147	3/4/64	
N	REVISED PER TDRR 07262 DR D.A. Clement CHK	3/23/64	

TABLE I

TABLE INDICATES LOADING OF HOUSING MODULES (FIND NO. 12) WITH MICRO NOR GATES (FIND NO. 13)
SEE NOTE 5

POSITION NO.

MODULE NO.	A1-A16	A17	A18	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30-A31	A32	A33-A34	A35	A36	A37	A38	A36	A28			
01						X								X										
03						X								X					X					
05								X																
07																								
09			X			X	X					X												
11						X																		
13						X																		
15						X																		
17									X															
19																								
21		X				X						X												
23															X									
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29						X	X					X		X										
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39						X																		
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69		X	X		X		X																	
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73		X							X												X			
75						X																		
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85						X																		
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89		X		X		X												X						
91																								
93		X									X										X			
95																								
97											X										X			
99							X																	
101											X										X			
103														X			X			X				
105											X		X				X			X				
107						X																		
109			X				X				X			X		X					X			
111																								
113				X							X			X							X			
115																								
117											X			X							X			
119				X										X										

CHART I

MODULE NO.	INSULATOR FIND NO. 8	INSULATOR FIND NO. 9	MATRIX 3 FIND NO. 5	MATRIX 5 FIND NO. 6	MATRIX 7 FIND NO. 7	PART NO.	REV	QUANTITY OF FIND NO. 2	SEE TABLE I FOR POSITION OF THESE COMPONENTS	
									QUANTITY OF FIND NO. 13	QUANTITY OF FIND NO. 14
A1-A16	1004170-3	1004170-1	1003063-2	1003064-3		1003081-1	N	1	60	60
~~A17~~	~~1004173-3~~	~~1004173-1~~	~~1003063-8~~	~~1003064-15~~		~~1003081-2~~			~~55~~	~~55~~
~~A18~~	~~1004172-3~~	~~1004172-1~~	~~1003063-6~~	~~1003064-11~~		~~1003081-3~~			~~56~~	~~56~~
~~A21~~	~~1004186-3~~	~~1004186-1~~	~~1003063-34~~	~~1003064-67~~	~~1003064-68~~	~~1003081-4~~	~~K~~	~~2~~	~~56~~	~~56~~
A22	1004183-3	1004183-1	1003063-28	1003064-55	1003064-56	1003081-5	N	2	59	59
A23	1004175-3	1004175-1	1003063-12	1003064-59		1003081-6	N	1	41	41
A24	1004185-3	1004185-1	1003063-32	1003064-63	1003064-64	1003081-7	N	2	54	54
A25	1004184-3	1004184-1	1003063-30	1003064-23		1003081-8	N	1	59	59
A26	1004179-3	1004179-1	1003063-20	1003064-39		1003081-9	N	1	58	58
~~A27~~	~~1004174-3~~	~~1004174-1~~	~~1003063-10~~	~~1003064-19~~		~~1003081-10~~			~~60~~	~~60~~
~~A28~~	~~1004182-3~~	~~1004182-1~~	~~1003063-26~~	~~1003064-51~~		~~1003081-11~~			~~52~~	~~52~~
~~A29~~	~~1004189-3~~	~~1004189-1~~	~~1003063-38~~	~~1003064-75~~		~~1003081-12~~	~~K~~	~~1~~	~~54~~	~~54~~
A30-A31	1004178-3	1004178-1	1003063-18	1003064-35		1003081-13	N	1	59	59
A32	1004176-3	1004176-1	1003063-14	1003064-27		1003081-14	N	1	52	52
A33-A34	1004177-3	1004177-1	1003063-16	1003064-31		1003081-15	N	1	57	57
A35	1004171-3	1004171-1	1003063-4	1003064-7		1003081-16	N	1	59	59
~~A36~~	~~1004187-3~~	~~1004187-1~~	~~1003063-36~~	~~1003064-71~~		~~1003081-17~~			~~57~~	~~57~~
~~A37~~	~~1004180-3~~	~~1004180-1~~	~~1003063-22~~	~~1003064-43~~		~~1003081-18~~	~~F~~	~~1~~	~~59~~	~~59~~
A38	1004181-3	1004181-1	1003063-24	1003064-47		1003081-19	N	1	59	59
A37	1004180-3	1004180-1	1003063-22	1003064-76		1003081-20	N	1	59	59
A36	1004187-3	1004187-1	1003063-40	1003064-78		1003081-21	N	1	56	56
A18	1004172-3	1004172-1	1003063-42	1003064-89		1003081-22	N	1	55	55
A27	1004174-3	1004174-1	1003063-46	1003064-19		1003081-23	N	1	60	60
A17	1004173-3	1004173-1	1003063-8	1003064-92		1003081-24	N	1	55	55
A28	1004182-3	1004182-1	1003063-48	1003064-94		1003081-25	N	1	53	53
A21	1004186-3	1004186-5	1003063-49	1003064-95	1003064-68	1003081-26	N	2	57	57
A29	1004189-5	1004189-1	1003063-38	1003064-75		1003081-27	N	1	54	54

Ⓙ REPLACES REV H WITH CHANGES

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

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DIMENSIONS ARE IN INCHES
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DO NOT SCALE THIS DRAWING
MATERIAL
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DRAWN DATE
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APPROVAL
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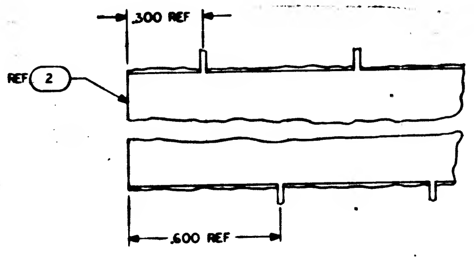
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MICRO LOGIC MODULE
SUB ASSEMBLY (ODD)
(TABULATED)

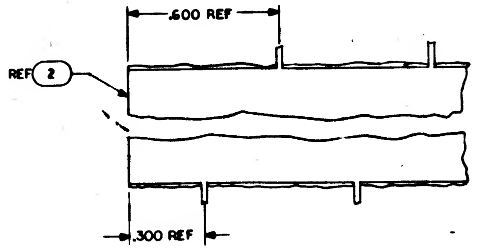
CODE IDENT NO. —
SIZE E
NASA DRAWING NO. 1003081
SCALE 4/1
WT
SHEET 3 OF 3

NOTICE – WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO

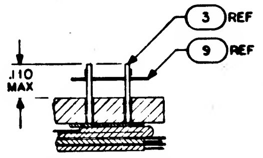
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
J	REPLACES REV H WITH CHANGES PER TDRR 04926		
K	REVISED PER TDRR 06024		
L	REVISED PER TDRR 06315	3/0/64	
M	REVISED PER TDRR 06147	3/4/64	
N	REVISED PER TDRR 07262 DR CHK	3/24/64	
P	REVISED PER TDRR 12831 DR CHK RTM	9/28/64	



SECTION A-A

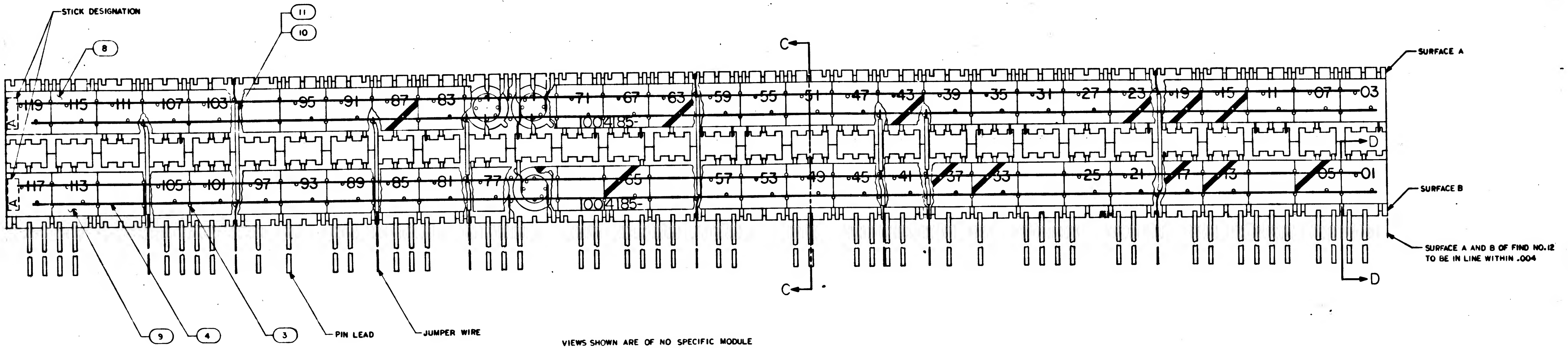


SECTION B-B

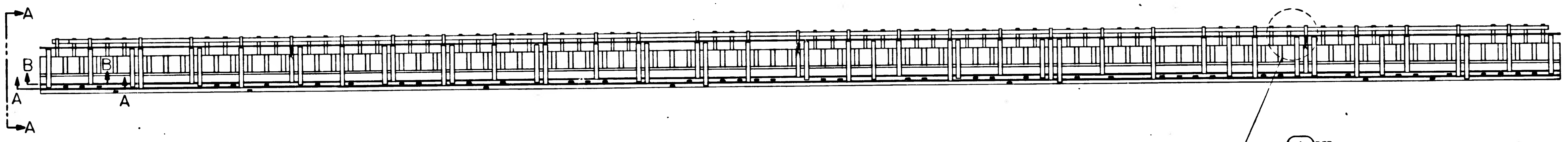


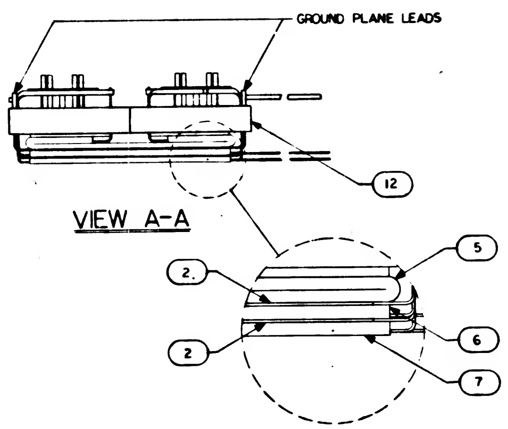
SECTION D-D

TYP FOR ALL LOCATIONS OF FIND NO.3

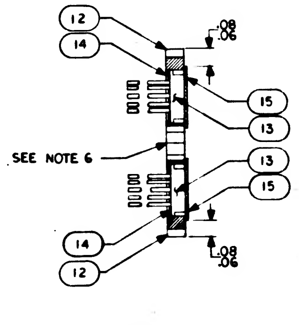


VIEWS SHOWN ARE OF NO SPECIFIC MODULE
JUMPER WIRES ARE TYPICAL OF MODULES
A1 THRU A16.



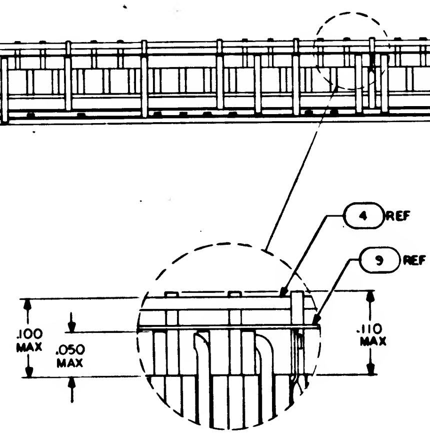


VIEW A-A



SECTION C-C

FIND NOS 2 THRU 11
REMOVED FOR CLARITY
SCALE: NONE



Ⓙ REPLACES REV H WITH CHANGES

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND1002005
3. AR DENOTES AS REQUIRED
4. CUT 3V BUSS BETWEEN GATES 87 AND 83
5. ☒ IN TABLE I SIGNIFIES FIND NO.13 AND FIND NO.14 TO BE OMITTED IN THIS POSITION
6. BOND HOUSINGS, FIND NO. 12 TOGETHER PER ND1002004, ORIENTING AS SHOWN

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
AR	1006826-3	INSULATION TAPE, ELECTRICAL	15
SEE CHART	1004627	INSULATOR	14
SEE CHART	1006771	MICRO-NOR GATE (TO-47)	13
2	1004095	HOUSING, MICROLOGIC (TO-47)	12
AR	1006757-8	WIRE, ELECTRICAL .020 DIA	11
AR	1006776-21	INSULATION, SLEEVING	10
1	SEE CHART I	INSULATOR, STICK	9
1	SEE CHART I	INSULATOR, STICK	8
1	SEE CHART I	.800 MATRIX ASSEMBLY (7)	7
1	SEE CHART I	.800 MATRIX ASSEMBLY (5)	6
1	SEE CHART I	1.400 MATRIX ASSEMBLY (3)	5
AR	1006757-7	WIRE, ELECTRICAL NICKEL .005 X .020	4
AR	1015402	WIRE, ELECTRICAL KOVAR	3
SEE CHART	1004100	GROUND PLANE	2
~~SEE CHART~~	~~SEE CHART~~	~~TO-47 HOUSING SUB ASSEMBLY (ODD)~~	~~1~~

LIST OF MATERIALS

NEXT ASSY	USED ON
1003174	
1003074	

APPLICATION

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CONTRACT
DRAWN
DATE
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MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MICRO LOGIC MODULE SUB ASSEMBLY (ODD)
(TABULATED)

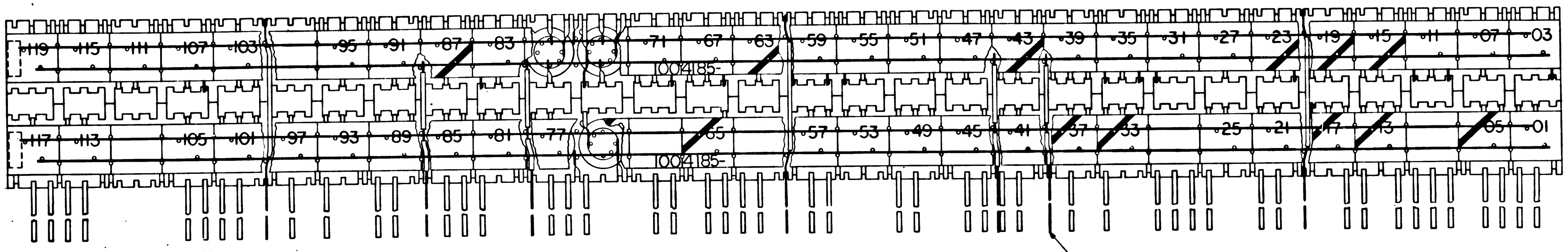
CODE IDENT NO —
SIZE E
NASA DRAWING NO 1003081
SCALE 4/1
WT
SHEET 1 OF 3

MASTER

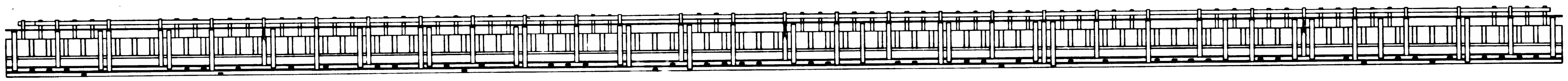
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
J	REPLACES REV H WITH CHANGES PER TDRR 04926	11-30-63	
K	REVISED PER TDRR 06024	29 Jan 64	
L	REVISED PER TDRR 06315	4/11/64	
M	REVISED PER TDRR 06147	4/4/64	
N	REVISED PER TDRR 04262 DR D.C. Clement CHK JLY	3/23/64	HLK
P	REVISED PER TDRR 12831 DR J.P. Leonard CHK	9/22/64	



VIEWS SHOWN ARE OF NO SPECIFIC MODULE.
JUMPER WIRES ARE TYPICAL OF MODULES A17, A18, A21 THRU A38



Ⓙ REPLACES REV H WITH CHANGES

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

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MICRO LOGIC MODULE SUB ASSEMBLY (ODD)
(TABULATED)

CODE IDENT NO. ———
SIZE E
NASA DRAWING NO. 1003081
SCALE 4/1
WT
SHEET 2 OF 3

NOTICE – WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

TABLE I

TABLE INDICATES LOADING OF HOUSING MODULES (FIND NO.12) WITH MICRO NOR GATES (FIND NO.13)
SEE NOTE 5

POSITION NO. \ MODULE NO.	A1-A16	A17	A18	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30-A31	A32	A33-A34	A35	A36	A37	A38	A36	A28			
01						X								X										
03						X								X					X					
05								X																
07																								
09			X			X	X					X												
11						X																		
13						X																		
15						X																		
17									X															
19																								
21		X				X						X												
23															X									
25			X																					
27																								
29						X	X					X		X										
31																								
33						X																		
35																								
37						X																		
39						X																		
41						X						X												
43															X									
45																								
47																								
49			X														X			X				
51																								
53												X												
55																								
57																								
59																								
61							X																	
63																								
65																								
67																								
69		X	X		X		X																	
71																								
73		X							X												X			
75						X																		
77																				X				
79						X						X			X									
81						X																		
83																								
85						X																		
87						X					X													
89		X		X		X												X						
91																								
93		X									X										X			
95																								
97											X										X			
99							X																	
101											X										X			
103														X			X			X				
105											X		X				X			X				
107						X																		
109			X				X				X			X		X					X			
111																								
113				X							X			X							X			
115																								
117											X			X							X			
119				X										X										

CHART I

MODULE NO.	INSULATOR FIND NO.8	INSULATOR FIND NO.9	MATRIX 3 FIND NO.5	MATRIX 5 FIND NO.6	MATRIX 7 FIND NO.7	PART NO.	REV	QUANTITY OF FIND NO. 2	SEE TABLE I FOR POSITION OF THESE COMPONENTS: QUANTITY OF FIND NO. 13	QUANTITY OF FIND NO.14
A1-A16	1004170-3	1004170-1	1003063-2	1003064-3		1003081-1	N	1	60	60
~~A17~~	~~1004173-3~~	~~1004173-1~~	~~1003063-8~~	~~1003064-15~~		~~1003081-2~~			~~55~~	~~55~~
~~A18~~	~~1004172-3~~	~~1004172-1~~	~~1003063-6~~	~~1003064-11~~		~~1003081-3~~			~~56~~	~~56~~
~~A21~~	~~1004186-3~~	~~1004186-1~~	~~1003063-34~~	~~1003064-67~~	~~1003064-68~~	~~1003081-4~~	[illegible]	~~2~~	[illegible]	[illegible]
A22	1004183-3	1004183-1	1003063-28	1003064-55	1003064-56	1003081-5	N	2	59	59
A23	1004175-3	1004175-1	1003063-12	1003064-59		1003081-6	N	1	41	41
A24	1004185-3	1004185-1	1003063-32	1003064-63	1003064-64	1003081-7	N	2	54	54
A25	1004184-3	1004184-1	1003063-30	1003064-23		1003081-8	N	1	59	59
A26	1004179-3	1004179-1	1003063-20	1003064-39		1003081-9	N	1	58	58
~~A27~~	~~1004174-3~~	~~1004174-1~~	~~1003063-10~~	~~1003064-10~~		~~1003081-10~~			~~60~~	~~60~~
~~A28~~	~~1004182-3~~	~~1004182-1~~	~~1003063-26~~	~~1003064-51~~		~~1003081-11~~			[illegible]	[illegible]
~~A29~~	~~1004189-3~~	~~1004189-1~~	~~1003063-38~~	~~1003064-78~~		~~1003081-12~~	[illegible]	~~1~~	[illegible]	[illegible]
A30-A31	1004178-3	1004178-1	1003063-18	1003064-35		1003081-13	N	1	59	59
A32	1004176-3	1004176-1	1003063-14	1003064-27		1003081-14	N	1	52	52
A33-A34	1004177-3	1004177-1	1003063-16	1003064-31		1003081-15	N	1	57	57
A35	1004171-3	1004171-1	1003063-4	1003064-7		1003081-16	N	1	59	59
~~A36~~	~~1004187-3~~	~~1004187-1~~	~~1003063-36~~	~~1003064-71~~		[illegible]			~~57~~	[illegible]
~~A37~~	~~1004180-3~~	~~1004180-1~~	~~1003063-28~~	~~1003064-43~~		[illegible]	[illegible]	~~1~~	[illegible]	[illegible]
A38	1004181-3	1004181-1	1003063-24	1003064-47		1003081-19	N	1	59	59
A37	1004180-3	1004180-1	1003063-22	1003064-76		1003081-20	N	1	59	59
A36	1004187-3	1004187-1	1003063-40	1003064-78		1003081-21	N	1	56	56
A18	1004172-3	1004172-1	1003063-42	1003064-89		1003081-22	N	1	55	55
A27	1004174-3	1004174-1	1003063-46	1003064-19		1003081-23	N	1	60	60
A17	1004173-3	1004173-1	1003063-8	1003064-92		1003081-24	N	1	55	55
A28	1004182-3	1004182-1	1003063-48	1003064-94		1003081-25	N	1	53	53
A21	1004186-3	1004186-5	1003063-49	1003064-95	1003064-68	1003081-26	N	2	57	57
A29	1004189-5	1004189-1	1003063-38	1003064-75		1003081-27	N	1	54	54

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
J	REPLACES REV H WITH CHANGES PER TDRR 07926	[illegible]	[illegible]
K	REVISED PER TDRR 06024	[illegible]	[illegible]
L	REVISED PER TDRR 06315	3/11/64	[illegible]
M	REVISED PER TDRR 06147	3/4/64	[illegible]
N	REVISED PER TDRR 07262 DR [illegible] CHK [illegible]	3/23/64	[illegible]
P	REVISED PER TDRR 72831 DR [illegible] CHK [illegible] RTM	9/28/64	[illegible]

Ⓙ REPLACES REV H WITH CHANGES .

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO

LIST OF MATERIALS

NEXT ASSY	USED ON

APPLICATION

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APPROVAL [illegible]
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MIT APPROVAL [illegible]

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

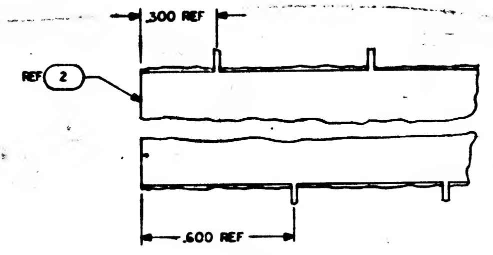
MICRO LOGIC MODULE
SUB ASSEMBLY (ODD)
(TABULATED)

CODE IDENT NO. ——
SIZE E
NASA DRAWING NO 1003081
SCALE 4/1
WT
SHEET 3 OF

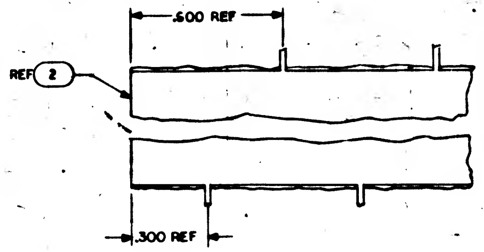
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS

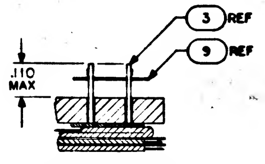
SYM	DESCRIPTION	DATE	APPROVAL
J	REPLACES REV H WITH CHANGES PER TDRR 04926	[illegible]	
K	REVISED PER TDRR 06024	29 Jan	
L	REVISED PER TDRR 06315	2/10/64	
M	REVISED PER TDRR 06147	3/4/64	
N	REVISED PER TDRR 07262 DR CHK	3/22/64	
P	REVISED PER TDRR 12831 DR J.P. CHK RTM	9/28/64	
R	REVISED PER TDRR 12830 DR CHK RTM	10/12/64	



SECTION A-A

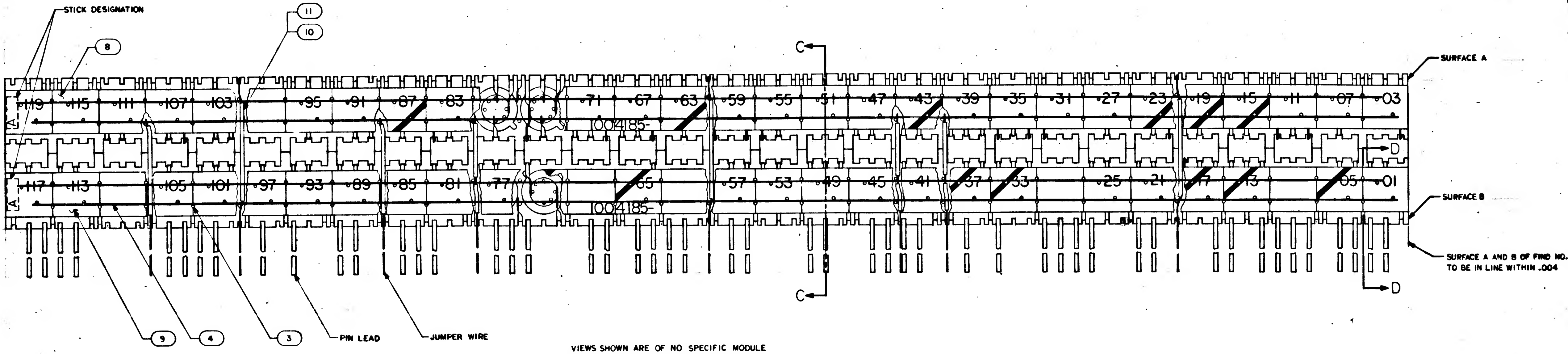


SECTION B-B

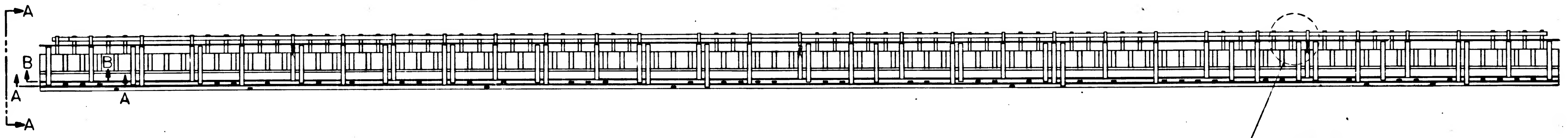


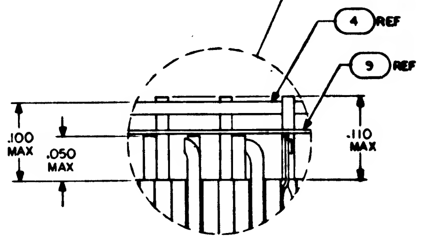
SECTION D-D

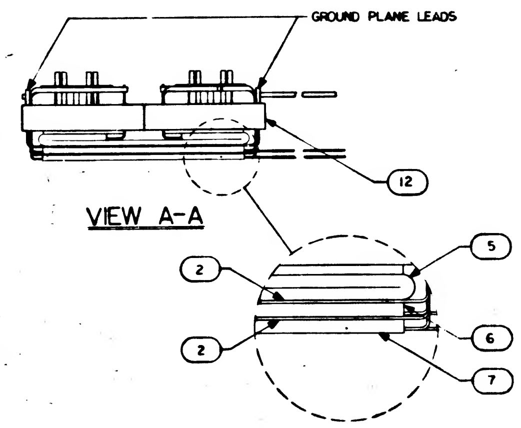
TYP FOR ALL LOCATIONS OF FIND NO. 3



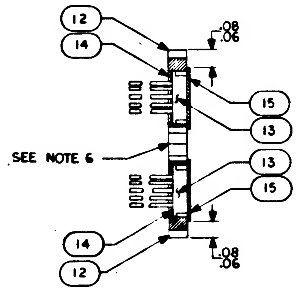
VIEWS SHOWN ARE OF NO SPECIFIC MODULE
JUMPER WIRES ARE TYPICAL OF MODULES
A1 THRU A16.







VIEW A-A



SECTION C-C

FIND NOS 2 THRU 11
REMOVED FOR CLARITY
SCALE: NONE

Ⓙ REPLACES REV H WITH CHANGES

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND1002005
3. AR DENOTES AS REQUIRED
4. CUT 3V BUSS BETWEEN GATES 87 AND 83
5. ▭ IN TABLE I SIGNIFIES FIND NO. 13 AND FIND NO. 14 TO BE OMITTED IN THIS POSITION
6. BOND HOUSINGS, FIND NO. 12 TOGETHER PER ND1002004, ORIENTING AS SHOWN

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
AR	1006826-3	INSULATION TAPE, ELECTRICAL	15
SEE CHART	1004627	INSULATOR	14
SEE CHART	1006771	MICRO-NOR GATE (TO-47)	13
2	1004658	HOUSING, MICROLOGIC (TO-47)	12
AR	1006757-8	WIRE, ELECTRICAL .020 DIA	11
AR	1006776-21	INSULATION, SLEEVING	10
1	SEE CHART I	INSULATOR, STICK	9
1	SEE CHART I	INSULATOR, STICK	8
1	SEE CHART I	.800 MATRIX ASSEMBLY (7)	7
1	SEE CHART I	.800 MATRIX ASSEMBLY (5)	6
1	SEE CHART I	1.400 MATRIX ASSEMBLY (3)	5
AR	1006757-7	WIRE, ELECTRICAL NICKEL .005 X .020	4
AR	1015402	WIRE, ELECTRICAL KOVAR	3
SEE CHART	1004100	GROUND PLANE	2
~~SEE CHART~~	~~SEE CHART~~	~~TO-47 HOUSING SUB ASSEMBLY (ODD)~~	~~1~~

LIST OF MATERIALS

NEXT ASSY	USED ON
1003174	
1003074	

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
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FRACTIONS ± DECIMALS ± ANGLES ±
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MATERIAL
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FINAL FINISH

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DWG. NO. CONTRACT
DRAWN DATE
CHECKED
APPROVAL
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MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

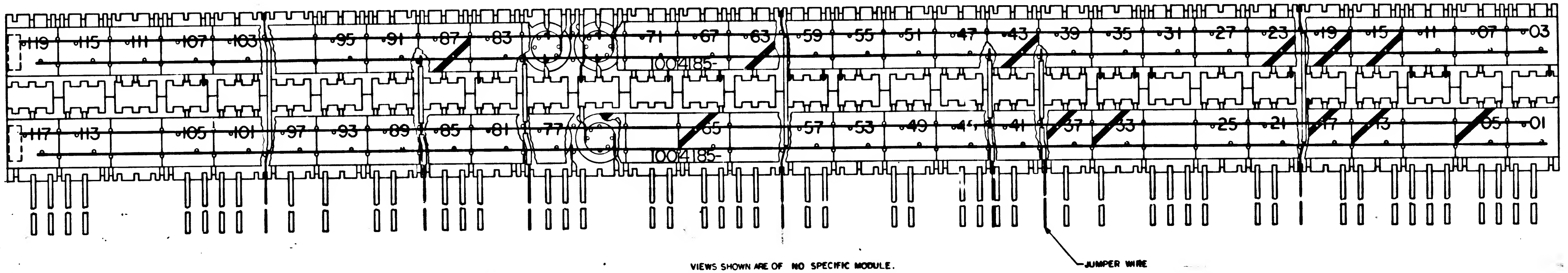
MICRO LOGIC MODULE SUB ASSEMBLY (ODD) (TABULATED)

CODE IDENT NO. —— SIZE E NASA DRAWING NO. 1003081
SCALE 4/1 WT SHEET 1 OF 3

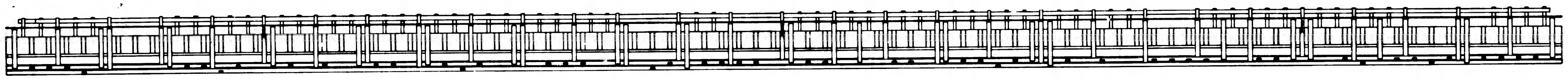
MASTER

[illegible]

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
J	REPLACES REV H WITH CHANGES PER TDRR 04986	11-10-63	
K	REVISED PER TDRR 06024	[illegible]	
L	REVISED PER TDRR 06315	4/11/64	
M	REVISED PER TDRR 06147	4/9/64	
N	REVISED PER TDRR 09262 DR CHK	3/23/64	HWK
P	REVISED PER TDRR 12831 DR J.P. CHK RTM	9/22/64	
R	REVISED PER TDRR 12830 DR CHK RTM	11/12/64	



VIEWS SHOWN ARE OF NO SPECIFIC MODULE.
JUMPER WIRES ARE TYPICAL OF MODULES
A17, A18, A21 THRU A38



Ⓙ REPLACES REV H WITH CHANGES

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.

LIST OF MATERIALS

NEXT ASSY | USED ON
APPLICATION

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DIMENSIONS ARE IN INCHES
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FRACTIONS ± DECIMALS ± ANGLES ±
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DRAWN DATE 9-25-63
CHECKED
APPROVAL
APPROVAL
NASA APPROVAL
MIT APPROVAL

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MICRO LOGIC MODULE SUB ASSEMBLY (ODD) (TABULATED)

CODE IDENT NO. ——
SIZE E
NASA DRAWING NO. 1003081
SCALE 4/1
WT
SHEET 2 OF 3

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TABLE I

TABLE INDICATES LOADING OF HOUSING MODULES (FIND NO. 12) WITH MICRO NOR GATES (FIND NO. 13)
SEE NOTE 5

MODULE NO. POSITION NO.	A1-A16	A17	A18	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30-A31	A32	A33-A34	A35	A36	A37	A38	A36	A28			
01						X								X										
03						X								X					X					
05								X																
07																								
09			X			X	X					X												
11						X																		
13						X																		
15						X																		
17									X															
19																								
21		X				X						X												
23															X									
25			X																					
27																								
29						X	X					X		X										
31																								
33						X																		
35																								
37						X																		
39						X																		
41						X						X												
43															X									
45																								
47																								
49			X														X			X				
51																								
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59																								
61							X																	
63																								
65																								
67																								
69		X	X		X		X																	
71																								
73		X							X												X			
75						X																		
77																				X				
79						X						X			X									
81						X																		
83																								
85						X																		
87						X					X													
89		X		X		X												X						
91																								
93		X									X										X			
95																								
97											X										X			
99							X																	
101											X										X			
103														X			X			X				
105											X		X				X			X				
107						X																		
109			X				X				X			X		X					X			
111																								
113				X							X			X							X			
115																								
117											X			X							X			
119				X										X										

CHART I

									SEE TABLE I FOR POSITION OF THESE COMPONENTS	
MODULE NO.	INSULATOR FIND NO. 8	INSULATOR FIND NO. 9	MATRIX 3 FIND NO. 5	MATRIX 5 FIND NO. 6	MATRIX 7 FIND NO. 7	PART NO.	REV	QUANTITY OF FIND NO. 2	QUANTITY OF FIND NO. 13	QUANTITY OF FIND NO. 14
A1-A16	1004170-3	1004170-1	1003063-2	1003064-3	X	1003081-1	R	1	60	60
~~A17~~	~~1004173-3~~	~~1004173-1~~	~~1003063-8~~	~~1003064-15~~	X	~~1003081-2~~			~~55~~	~~55~~
~~A18~~	~~1004172-3~~	~~1004172-1~~	~~1003063-6~~	~~1003064-11~~	X	~~1003081-3~~			~~56~~	~~56~~
~~A21~~	~~1004186-3~~	~~1004186-1~~	~~1003063-34~~	~~1003064-67~~	~~1003064-68~~	~~1003081-4~~	~~R~~	~~2~~	~~58~~	~~58~~
A22	1004183-3	1004183-1	1003063-28	1003064-55	1003064-56	1003081-5	R	2	59	59
A23	1004175-3	1004175-1	1003063-12	1003064-59	X	1003081-6	R	1	41	41
A24	1004185-3	1004185-1	1003063-32	1003064-63	1003064-64	1003081-7	R	2	54	54
A25	1004184-3	1004184-1	1003063-30	1003064-23	X	1003081-8	R	1	59	59
A26	1004179-3	1004179-1	1003063-20	1003064-39	X	1003081-9	R	1	58	58
~~A27~~	~~1004174-3~~	~~1004174-1~~	~~1003063-10~~	~~1003064-19~~	X	~~1003081-10~~			~~60~~	~~60~~
~~A28~~	~~1004182-3~~	~~1004182-1~~	~~1003063-26~~	~~1003064-51~~	X	~~1003081-11~~			~~53~~	~~53~~
~~A29~~	~~1004189-3~~	~~1004189-1~~	~~1003063-38~~	~~1003064-75~~	X	~~1003081-12~~	~~R~~	~~1~~	~~54~~	~~54~~
A30-A31	1004178-3	1004178-1	1003063-18	1003064-35	X	1003081-13	R	1	59	59
A32	1004176-3	1004176-1	1003063-14	1003064-27	X	1003081-14	R	1	52	52
A33-A34	1004177-3	1004177-1	1003063-16	1003064-31	X	1003081-15	R	1	57	57
A35	1004171-3	1004171-1	1003063-4	1003064-7	X	1003081-16	R	1	59	59
~~A36~~	~~1004187-3~~	~~1004187-1~~	~~1003063-36~~	~~1003064-71~~	X	~~1003081-17~~			~~57~~	~~57~~
~~A37~~	~~1004180-3~~	~~1004180-1~~	~~1003063-22~~	~~1003064-43~~	X	~~1003081-18~~	~~R~~	~~1~~	~~59~~	~~59~~
A38	1004181-3	1004181-1	1003063-24	1003064-47	X	1003081-19	R	1	59	59
A37	1004180-3	1004180-1	1003063-22	1003064-76	X	1003081-20	R	1	59	59
A36	1004187-3	1004187-1	1003063-40	1003064-78	X	1003081-21	R	1	56	56
A18	1004172-3	1004172-1	1003063-42	1003064-89	X	1003081-22	R	1	55	55
A27	1004174-3	1004174-1	1003063-46	1003064-19	X	1003081-23	R	1	60	60
A17	1004173-3	1004173-1	1003063-8	1003064-92	X	1003081-24	R	1	55	55
A28	1004182-3	1004182-1	1003063-48	1003064-94	X	1003081-25	R	1	53	53
A21	1004186-3	1004186-5	1003063-49	1003064-95	1003064-68	1003081-26	R	2	57	57
A29	1004189-5	1004189-1	1003063-38	1003064-75	X	1003081-27	R	1	54	54

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
J	REPLACES REV H WITH CHANGES PER TDRR 07906		
K	REVISED PER TDRR 06024		
L	REVISED PER TDRR 06315	3/11/64	
M	REVISED PER TDRR 06147	3/4/64	
N	REVISED PER TDRR 07262 DR R.O. Clement CHK Oell	3/23/64	
P	REVISED PER TDRR 72831 DR CHK Oell RTM	9/28/64	
R	REVISED PER TDRR 12830 DR CHK Oell RTM	10/12/64	

Ⓙ REPLACES REV H WITH CHANGES

MASTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO

LIST OF MATERIALS

NEXT ASSY	USED ON
APPLICATION	

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MATERIAL
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APPROVAL
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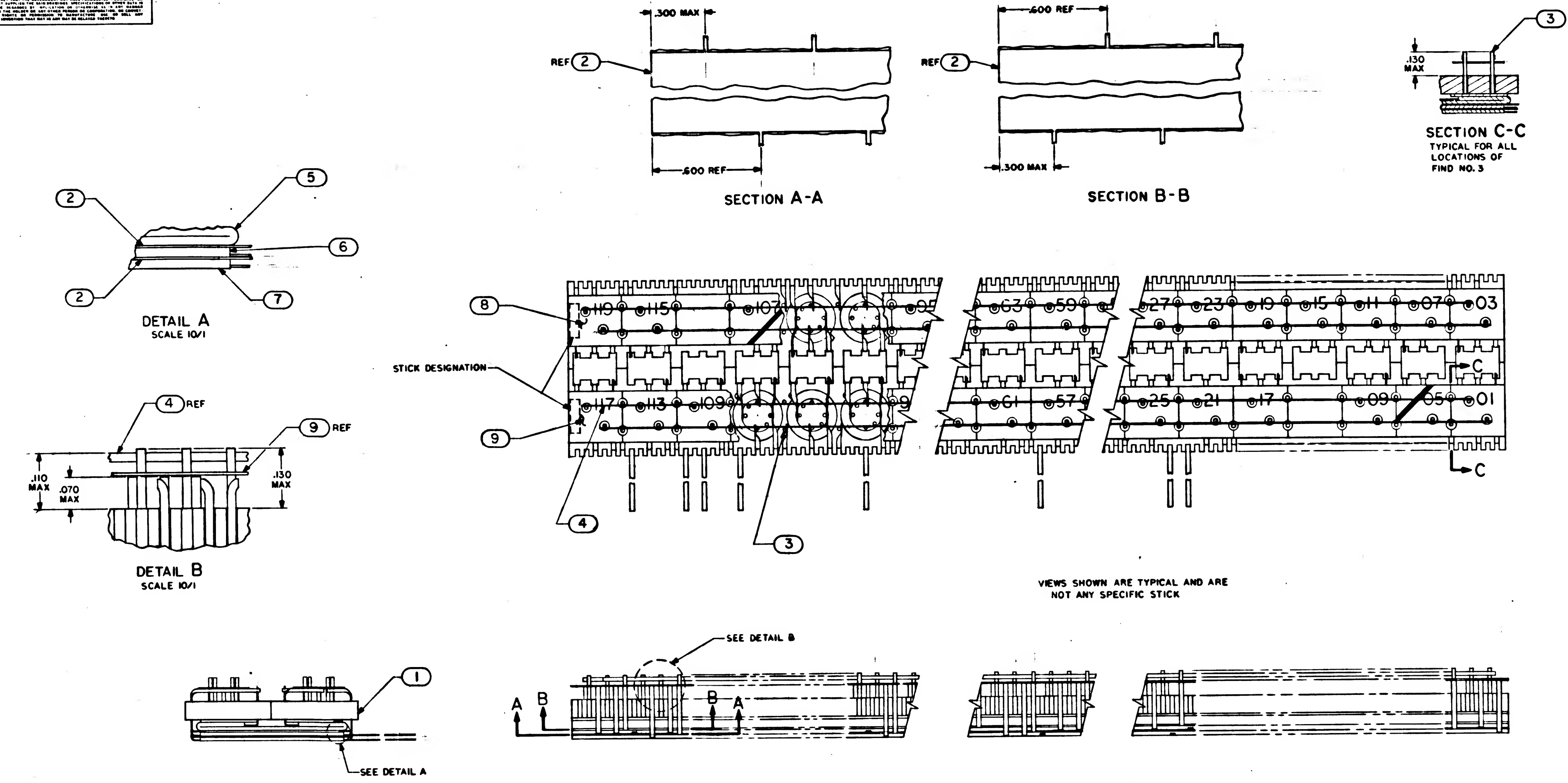
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

MICRO LOGIC MODULE SUB ASSEMBLY (ODD) (TABULATED)

CODE IDENT NO.	SIZE	NASA DRAWING NO
——	E	1003081
SCALE 4/1	WT	SHEET 3 OF 3

NOTICE -- WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL



FOR INFORMATION ONLY

CLASS B RELEASE TDR No. 00514 DATE 6 Mar 63

DESCRIPTION	STICK NO.	INSULATOR FIND NO. 8	INSULATOR FIND NO. 9	MATRIX 3 FIND NO. 5	MATRIX 5 FIND NO. 6	MATRIX 7 FIND NO. 7	TO-47 HOUSING
ARITHMETIC STICK	C1-16	1004015-3	1004015-1	1003063-1	1003064-3		

NOTES:
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. WELD PER ND1002005
3. BOND FIND NOS 1, 2, 5, 6, AND 7 PER ND1002004
4. A.R. DENOTES AS REQUIRED

LIST OF MATERIALS

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO
1	SEE CHART	INSULATOR, STICK	9
1	SEE CHART	INSULATOR, STICK	8
1	SEE CHART	.800 MATRIX ASSEMBLY (7)	7
1	SEE CHART	.800 MATRIX ASSEMBLY (5)	6
1	SEE CHART	1.400 MATRIX ASSEMBLY (3)	5
A.R.	1006757-7	WIRE, ELEC NICKEL .005 X .020	4
A.R.	1015402	WIRE, ELEC KOVAR	3
2	1004100	GROUND PLANE	2
1	SEE CHART	TO-47 HOUSING SUB-ASSEMBLY (ODD)	1

MASTER

1003074	
NEXT ASSY	USED ON
APPLICATION	

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CONTRACT
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CHECKED 3/5/63
APPROVAL 3/5/63
APPROVAL SO 3/6/63
NASA APPROVAL
MIT APPROVAL 6 Mar 63

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MICRO-LOGIC STICK SUB-ASSEMBLY (ODD)

CODE IDENT NO.
SIZE E
NASA DRAWING NO. 1003081
SCALE 4/1
WT
SHEET 1 OF 1

E 1003081